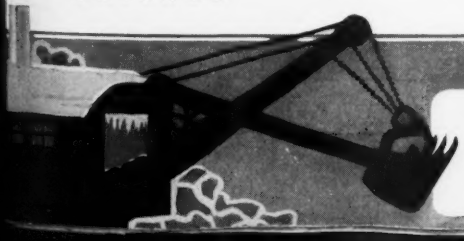
Pit and Quarry

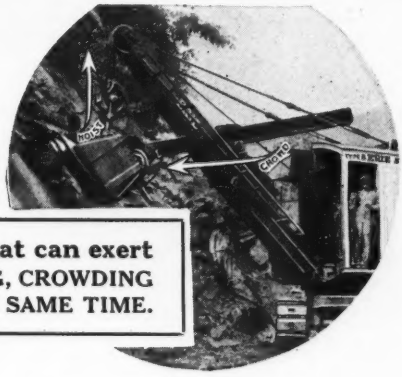
SAND · GRAVEL · STONE
CEMENT · LIME · GYPSUM



October 1, 1925

Circulation 7,600

Load More Rock every day



With the ERIE— the shovel that can exert THE FULL POWER OF ITS HOISTING, CROWDING AND SWINGING ENGINES AT THE SAME TIME.

When the dipper tugs at a stubborn ledge of rock, the operator leaves the ERIE's hoisting throttle wide open— full steam on the hoisting pull—

While he works the crowding lever back and forth, prying the rock loose by moving the dipper in and out while pulling up, *and also swings the shovel slightly from right to left, to pry sideways.*

It is easy to see how much the ERIE's digging power would be cut down if the "crowd" and "swing" were driven (through friction clutches) by the same engine that was *already forced beyond its maximum load* to meet the demands of the hoisting pull.

Most quarrymen want to have plenty of *speed* on tap for rush orders. That's one reason why you see far more ERIES than any other shovel in the 20-ton class.

The reliable ERIE is your best insurance against lost time

Breakdowns are almost unknown with an ERIE— the most highly developed power shovel ever built. (Far more ERIES in service than any other shovel of one size and type.)

Actual records, kept by hundreds of owners, show that ERIES cost only ⅓ as much for upkeep and MAKE A CORRESPONDING SAVING IN WORKING TIME.

Even in the hardest rock excavation, the ERIE'S dipper teeth get the full power of the engines without a smashing jar. No need to bang into a rock in order to hold fly-wheel momentum— the steam's expansive force comes smoothly, giving the dipper a valuable "cushion" against sudden shocks. Protects the entire mechanism.

ERIE STEAM SHOVEL CO.

Erie, Pa., U. S. A.

Builders of ERIE Shovels, Cranes, Ditchers, Draglines, Trench Hoes, etc.

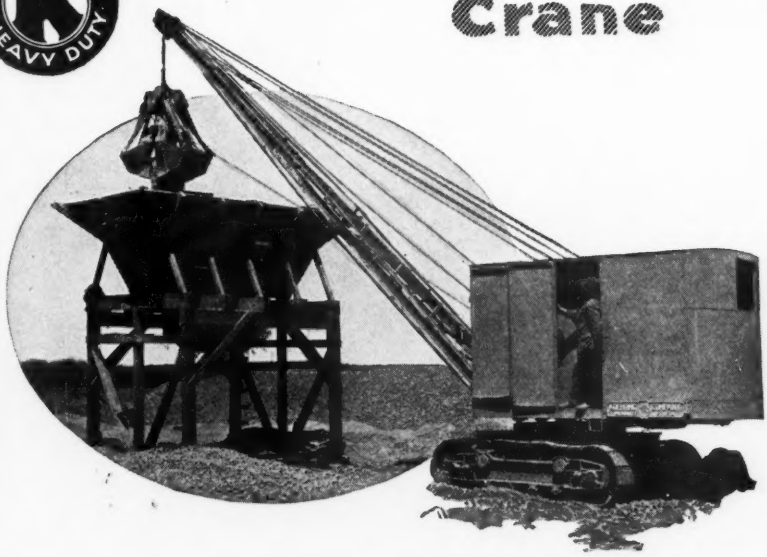
Branch Offices:
Boston New York
Philadelphia
Atlanta Pittsburgh
Chicago

Representatives throughout the U. S. A.

ERIE Revolving Shovels

KOEHRING

Crane



Easy Control Means Speedy Action! Capacity!

THE operator handles the Koehring Crane with his fingers — not with his weight! He can shift the levers with light pressure! Pedals are as easy! Double outside-band friction clutches make control easy. Operator maintains top capacity every minute of the day. Besides, easy control gives zip and speed to every function.

Booming and hoisting may be combined in one operation instead of two stop-and-go operations. The Koehring is designed for it. No excessive wear!

Koehring heavy duty construction is the soundest value you can buy in a crane. It is the distinctive value in the crane field.

Write for Crane Bulletin C E 32

KOEHRING COMPANY

PAVERS--MIXERS--GASOLINE CRANES, DRAGLINES AND SHOVELS

MILWAUKEE, WISCONSIN

Sales Offices and Service Warehouses in all principal cities

Foreign Department—Room 1370, 50 Church St., New York

Canada—Koehring Company of Canada, Ltd., 105 Front Street, East, Toronto, Ontario.

Mexico—F. S. Lapum, Cinco De Mayo 21, Mexico, D. F

Crane Capacities

No. 1—¾ cu. yd. clam-shell bucket on 40 ft. boom, standard.

Lifting capacity, 10 tons at 12 ft. radius.

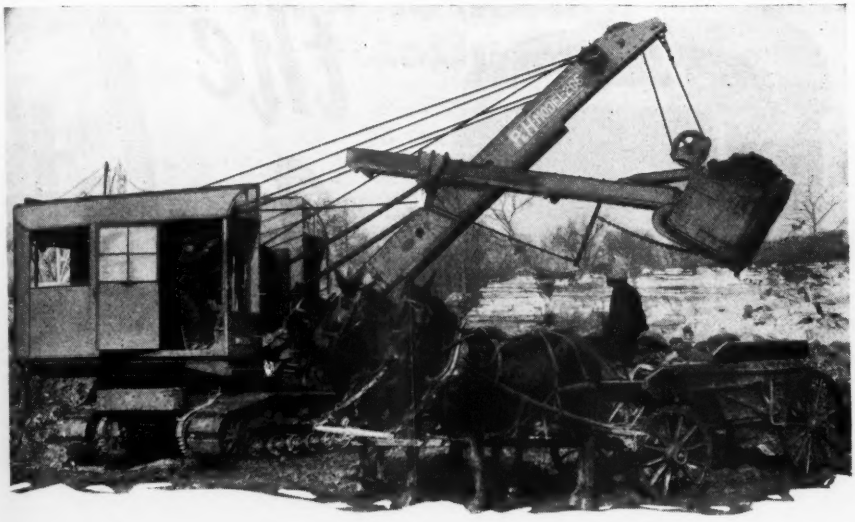
4 cylinder, 5 in. by 6 in. gasoline engine, 1000 R. P. M.

No. 2—1 cu. yd. clam-shell bucket on 45 ft. boom, standard.

Lifting capacity, 15 tons at 12 ft. radius.

4 cylinder, 5¾ in. x 7 in. gasoline engine, 1000 R. P. M.

A 2324-III-IV



Easy and Fast Quarry Stripping

THE Independence Quarry Co. operate a very complete and efficient quarry near Kansas City. Rock is supplied for the operations of tne well-known Ross Construction Co. of that city, the surplus being used for the outside market. The work of stripping the top soil has been left to a Model 206 P & H Gasoline Shovel pictured here.

Fast and mobile, the powerful crowding motion of the P & H is exerted throughout the dipper movement. The new power clutch control provides utmost ease in handling—the control is almost push-button easy.

These important factors along with the sturdy construction and low maintenance of P & H have been directly responsible for big yardage, steady daily operation and real economy.

P & H can help you make an easy and quick job of your quarry stripping or similar excavation work—a profitable worker wherever used. Bulletin 82-X gives all details. Write for a copy.

HARNISCHFEGER CORPORATION
Successor to
PAWLING & HARNISCHFEGER CO.
Established in 1884
3851 National Avenue, Milwaukee, Wis.

New York	Birmingham	Kansas City	Pittsburgh	Seattle
Dallas	San Francisco	Detroit	Memphis	Portland
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Warehouses and Service Stations:
New York Memphis Jacksonville San Francisco Los Angeles Seattle

P&H GASOLINE SHOVEL

the best

AMSCO Missabe Dipper with Vanderhoef Front

That's what all Users say of—

Amsco Missabe Dippers equipped with the Vanderhoef Front. They have put this sturdy dipper to tests of the toughest nature and they have always found it worthy.

The United Verde Copper Co., Jerome, Arizona, are using two shovels equipped with 4-yard Amsco Missabe Dippers and one shovel equipped with an 8-yard Amsco Missabe Dipper—both dippers have Vanderhoef Fronts.

A Few Reasons Why

1. Made throughout of Manganese Steel.
2. Teeth Bases are cast integrally with front.
3. Interchangeable and reversible points.
4. Operates under less power—loads and unloads with ease.
5. Smooth inside front eliminates clogging.
6. Uniform metal sections equalize strains from socket casting to lip.
7. General scientific construction and long wearing qualities make for higher efficiency.

In a letter to his General Manager at Clarkdale, Arizona, the Supt. of Shovel Operations, writes of Missabe-Vanderhoef Dippers as follows:

"Personally I consider this the best equipment on the market as the fronts are built to stand long wear and heavy strains and the width of the tooth being comparatively thin at the base . . . permits easy filling of the bucket.

I have talked with numerous shovel operators . . . and they are all agreed that this is the best equipment obtainable."

It's not at all unusual that Missabe-Vanderhoef dippers should be classed as "best." Read the "Reasons Why" and write for prices and literature.

AMERICAN MANGANESE STEEL CO.

General Offices: 388 E. Fourteenth St., Chicago Heights, Ill.

Foundries: Chicago Heights, Ill.; New Castle, Del.; Oakland, Cal.; Los Angeles, Cal.; Denver, Colo. Southern Manganese Steel Co., St. Louis, Mo.

AMSCO

TRADE MARK REGISTERED

Du Pont chemical engineers insure uniformity of quality by chemical control through every step of manufacture from raw material to finished product.

How to Secure Better Blasting Results

THE solution of blasting problems can be accomplished by adopting the methods proposed by the explosives experts composing the technical field staff of the du Pont Company.

Equipped with an extensive experience covering the selection and use of explosives, these expert "powder" men carry on their investigations in a thorough and efficient manner. The result is a practical and effective plan whereby the explosives required perform their work with a minimum expenditure of material, labor and time.

Put your powder problems up to du Pont—over 123 years of continuous activity in developing and making explosives for every requirement.

In quarrying operations use du Pont Explosives

There is a du Pont explosive to meet every blasting need—to do *your* particular work *best* at *least* expense.

Du Pont blasting accessories give you maximum efficiency from your explosives. Make every shot *sure*—protect your blasting investment by using only du Pont accessories.

For further information about au Pont explosives and blasting accessories, please refer to MINING CATALOG—METAL QUARRY EDITION and PIT and QUARRY HAND BOOK—or write to nearest office.

E. I. DU PONT DE NEMOURS & CO., Inc.
Explosives Department **Wilmington, Del.**

DU PONT

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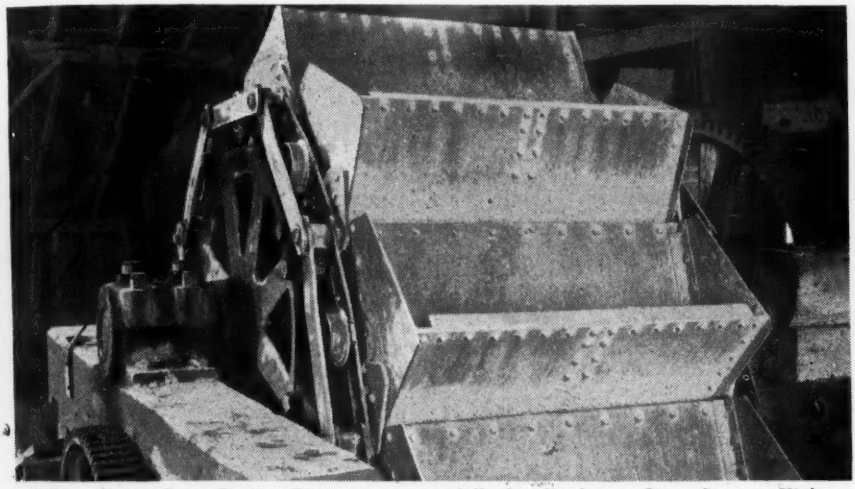
Du Pont Products Exhibit
Atlantic City, N. J.

POWDER MAKERS SINCE 1802



Jeffrey Heavy-Duty Bucket Elevators successfully handle Stone, Ores, Cement Clinker and similar materials in capacities up to 700 tons per hour.

Here Are the Features You've Wanted in a Bucket Elevator

HIGH quality steel chains with hardened steel knuckles to withstand the enormous driving action of the sprocket teeth.

Thru rods to keep the two strands of chain in perfect alignment at all times.

Hardened steel bushings thru the knuckles and fixed in the chain side bar to protect the thru rods from wear.

Large self-oiling bushed rollers assembled midway in the link for carrying weight of chain and buckets and to reduce power consumption.

Renewable sprocket teeth.

Heavy steel buckets with reinforced lips.

Ask for complete details and prices.

The Jeffrey Mfg. Co., 917-99 North Fourth Street Columbus, Ohio

New York	Scranton, Pa.	Chicago	Salt Lake City
Buffalo	Boston	Detroit	Los Angeles
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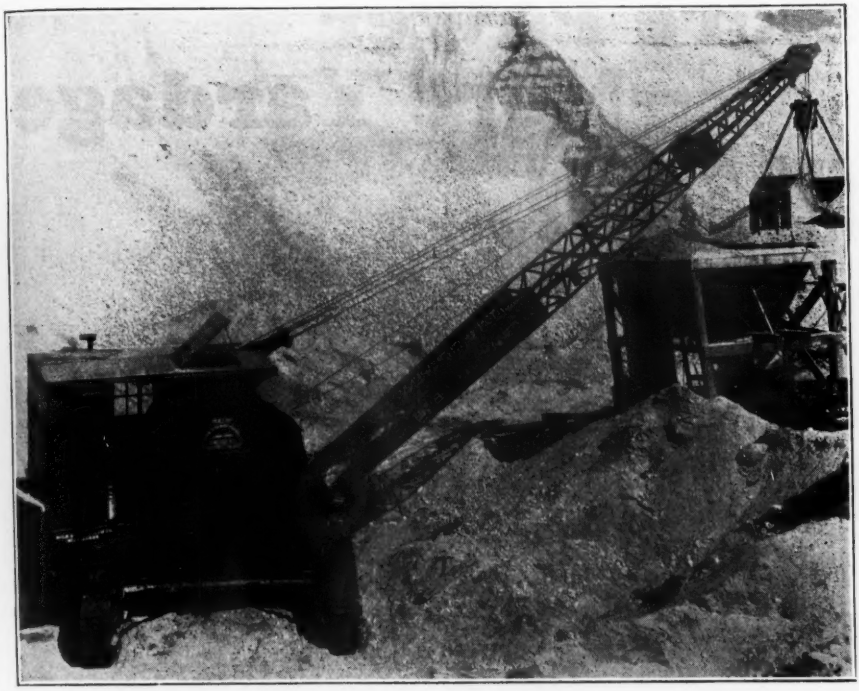
Pittsburgh	Charleston, W. Va.	Denver	Montreal

JEFFREY

MATERIAL HANDLING EQUIPMENT



Here's How

to handle gravel profitably

The Peterson Sand & Gravel Co., of Janesville, Wisconsin, know how to handle gravel profitably.

They use an O-S Type "E" Crane with 40-foot boom and 1-yard O-S Clamshell to load their hopper and a belt conveyor carries the gravel to the washing plant.

Many pit operators are using Peterson's System and their answer is "maximum yardage" at the end of each day.

The Type "E" is only one of the many sizes and styles of cranes we manufacture—

Send for catalog No. 37—it illustrates them.

ORTON & STEINBRENNER CO.

Locomotive Cranes, Flexible Tread Cranes, Gantry Cranes, Truck Cranes.

608 So. Dearborn Street
CHICAGO, ILL.

Clamshell Buckets, Orange Peel Buckets, Rock Crushers, Power Shovels.

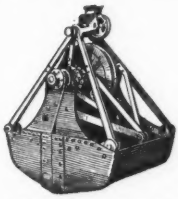
Hayward Buckets

Fitting the bucket to the job

Hayward Engineers have pioneered the development of every outstanding advance in the design of automatic grab buckets. They are particularly well equipped to help you make your digging dollars do a bigger and better job by showing how to harmonize bucket, hoist and service conditions—they can render a valuable service by *fitting the bucket to the job.*

Having devoted a major effort for more than 40 years to building better buckets, it is natural that we have the only *complete* line of buckets made. Our line includes every type and many variations of each—enabling you to obtain the correct type and size for any digging, dredging or rehandling purpose.

We shall be glad to send bulletins and catalogs on standard applications or supply data on special requirements.



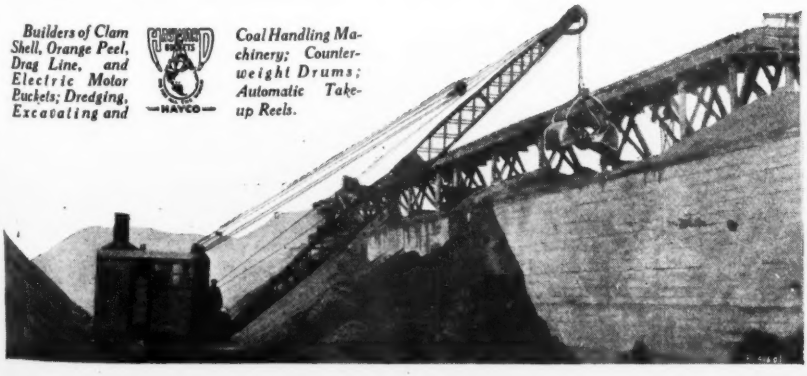
Clam Shell Bucket

Orange Peel Bucket

Drag Line Bucket

THE HAYWARD COMPANY
54-56 Church Street New York, N. Y.

Builders of Clam Shell, Orange Peel, Drag Line, and Electric Motor Buckets; Dredging, Excavating and Coal Handling Machinery; Counterweight Drums; Automatic Take-up Reels.



Three Motors in a Wintry World

Since August 15, 1924, these three type CS motors have been running as a test on a rough platform outside the Westinghouse East Pittsburgh plant. They are in the open weather, as here shown. To add spice to their existence, nitric acid (up to 25% concentration) has regularly been sprayed on them.

Nobody ever expected that these motors would keep going for a year under such handicaps, but they're still going strong. From every indication now they'll be running when the 1926 baseball season opens.

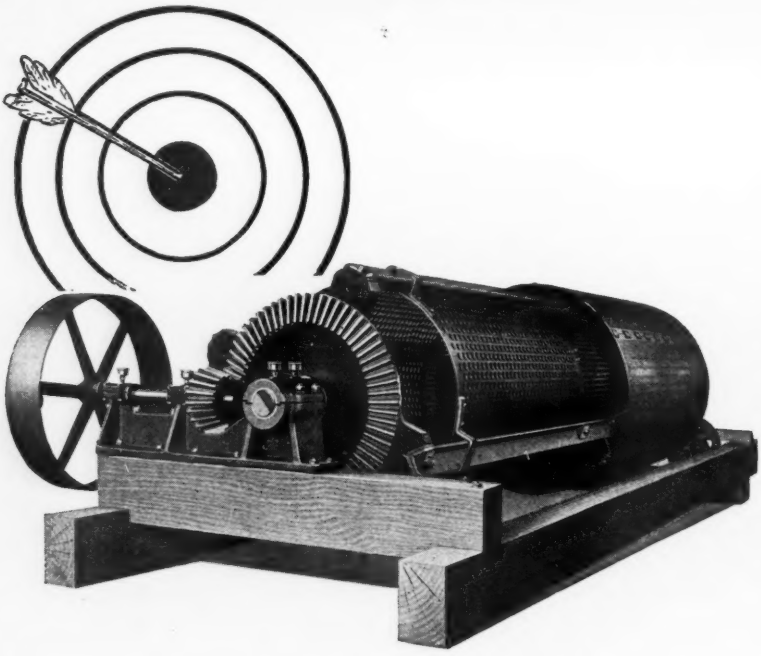
In this test you see how Westinghouse insulation is balanced to all the other parts of the motor.

A majority of Westinghouse motors have mica for main insulation—more mica than will be found in any other motors. Mica resists heat, water and acid because it is a basic mineral.

Then, to make protection trebly sure, the windings of Westinghouse motors are dipped in varnish and *baked*. Only Westinghouse uses this process for motors for glass plant, brick plant, cement mill, quarry and other standard industrial service.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO., EAST PITTSBURGH, PA.
Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse Motors are Balanced



Our aim for Toepfer Screens

TOEPFER Screens are built especially to meet the needs of screening in pit or quarry, and that our aim to meet these needs has been successful is evidenced by the many highly satisfactory installations of Toepfer Screens.

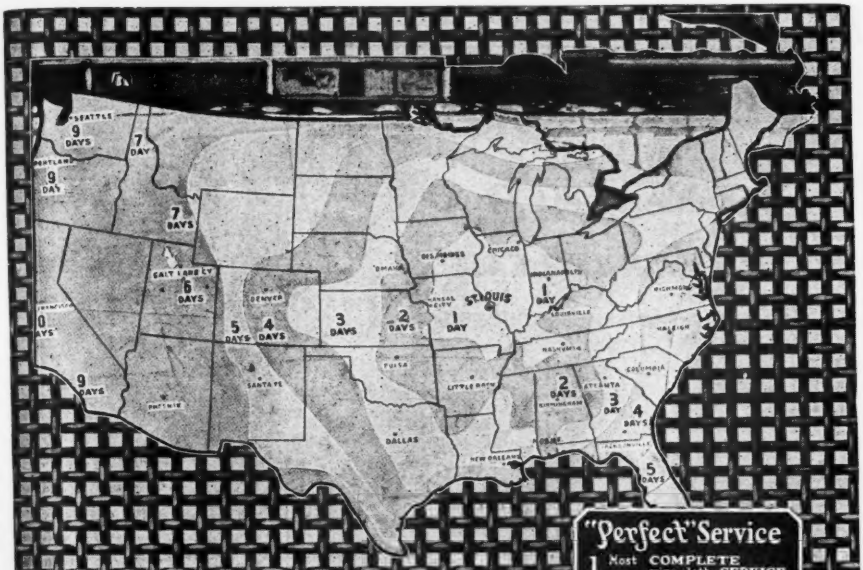
Toepfer combination screens produce well washed and sized material at a lower cost in power and water than any other type of scrubber. Steel angles run longitudinally with the scrubber section, which raise and drop the material and water continually, insuring a high grade product. The best of materials are used, and rigidity and perfect alignment are secured.

The Toepfer combination screen and scrubber will deliver as many sizes as our regular screen without additional space being required. A card request will bring you our catalog. Send for it today.

W. TOEPFER & SONS CO.
Broadway and Menominee St.,
MILWAUKEE, WIS.

TOEPFER

REVOLVING SCREENS



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2. Most **ACCESSIBLE** wire cloth **SERVICE**
3. Most **RELIABLE** wire cloth **SERVICE**
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Birmingham, Ala.	2	Macon, Ga.	4
Boston, Mass.	4	Memphis, Tenn.	2
Butte, Mont.	6	Mobile, Ala.	2
Cairo, Ill.	1	New Orleans, La.	3
Chattanooga, Tenn.	2	New York City, N. Y.	3
Chicago, Ill.	1	Omaha, Nebr.	2
Cincinnati, O.	1	Philadelphia, Pa.	3
Cleveland, Ohio	2	Pittsburgh, Pa.	2
Columbia, S. C.	4	Portland, Oregon	9
Dallas, Texas	3	Richmond, Va.	4
Denver, Colo.	4	Salt Lake City, Utah	6
Des Moines, Iowa.	1	San Antonio, Tex.	4
Detroit, Mich.	2	San Francisco, Calif.	10
El Paso, Texas.	5	Seattle, Wash.	9
Ft. Wayne, Ind.	1	Sioux Falls, S. D.	4
Ft. Worth, Texas.	3	Shreveport, La.	3
Houston, Texas	4	St. Paul, Minn.	3
Indianapolis, Ind.	1	Terre Haute, Ind.	1
Jackson, Miss.	3	Tulsa, Oklahoma	2
Jacksonville, Fla.	4	Washington, D. C.	4
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Kansas City, Mo.	1		

—and Express arrives in half the time!

Package Car Delivery from St. Louis over twenty-six great Railway Systems, **puts us nearest to your needs.**

Our Screen book brings **complete Screen Service** to your desk.

This Text-book gives all information on the Thousand Ludlow-Saylor Woven Screens.

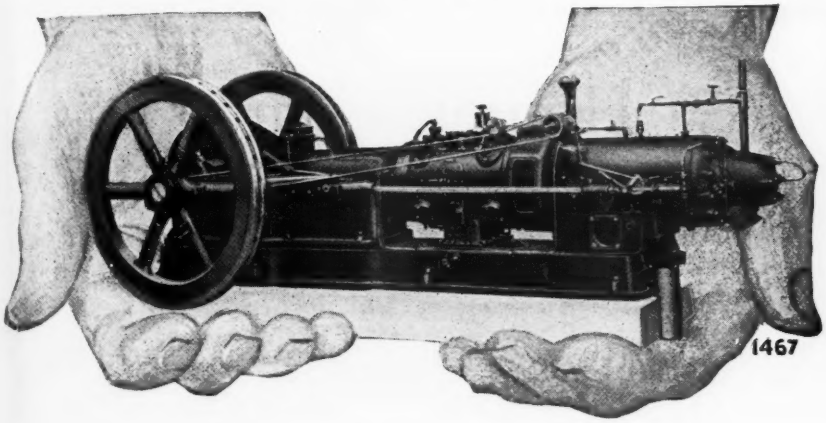
The comprehensive tables, with hundreds of actual-size illustrations, make complete, reliable screen data instantly available.

Send for your copy of Catalog No. 47-E. Free to users of Screens.

The city surrounded by the United States

The LUDLOW-SAYLOR WIRE COMPANY St. Louis

610 SOUTH NEWSTEAD AVE.



One-Unit Chicago Pneumatic Air Compressor Operates on Low-Cost Fuel Oils

NO other air power plant excels the economy of the Chicago Pneumatic Fuel Oil Engine-Driven Air Compressor.

Combining in one unit the Giant Oil Engine and C-P Simplate Valve Air Compressor, it insures in compact form an *unfailing air supply economically produced.* Can be used in batteries to meet varying load demands.

Available in capacities of from 144 to 658 cu. ft. per minute. Also, built for portable use in skid and tank-mounted types, capacities 144 and 212 cu. ft. per minute.

Ask for Bulletin 731.

Besides stationary, portable and semi-portable air compressors, oil, gasoline, steam and electric-driven types, this company manufactures oil and gas engines. Also, a complete line of rock drills. Descriptive bulletins sent upon request.

Chicago Pneumatic Tool Company
Chicago Pneumatic Building 6 East 44th Street · New York
*Sales and *Service Branches all over the world*

*Cleveland *Detroit El Paso Reno | Franklin Houston Joplin *Los Angeles | Milwaukee *Niagara Falls *New Orleans *New York | *Philadelphia Pittsburgh Richmond Salt Lake City | San Francisco Seattle *St. Louis | Basle *Berlin Bombay | Brussels *Buenos Aires Christiania | *Praetzburgh Havana Helsingfors Honolulu | Johannesburg *London Manila Milan | *Montreal *Montevideo Osaka Paris | Rio de Janeiro Rotterdam Santiago *São Paulo | Seoul Shanghai Tientsin | Tokyo *Toronto *Vancouver *Winnipeg

BOYER PNEUMATIC HAMMERS · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · VACUUM PUMPS · PNEUMATIC HOISTS
GIANT OIL AND GAS ENGINES · ROCK DRILLS · COAL DRILLS

CHICAGO *The Compressor with* **PNEUMATIC** *the Simplate Valve*

More and more rock products are being bought and sold by weight. Where loads are heavy and must be handled swiftly, the installation illustrated here is ideal. It consists of a Fairbanks Type "S" Auto Truck Scale, equipped with a dial which instantaneously shows the weight directly to the full capacity of the scale. 420 loads were weighed over this outfit in one 10-hour day.

Would you expect a wagon to stand an *auto truck load*?

Then why expect a *wagon* scale to stand *auto truck weighing?* If your wagon scale has given good service, it deserves an honorable discharge—before it fails under a load it was not *built* to stand.

With the coming of the auto truck, Fairbanks engineers foresaw the doom of the lighter "wagon scale" construction and immediately designed a truck scale ruggedly built to give lifetime service under the most trying conditions.

Basically, the problem was not new; for the extensive line of Fairbanks Scales had for years included Railway Track Scales and Grain Hopper Scales for weighing enormous loads. The time tested principle used in these scales has been adapted to the Fairbanks Type "S" Auto Truck Scale.

The result is a scale that will permanently "stand the gaff" of the motor truck—the impact on the platform, the concentrated load, the multiplied stress on the scale members. It is a scale that will *stay* accurate under this modern weighing condition.

The installation of one of these super-scales cannot fail to increase the confidence and goodwill of your trade. Moreover, it will probably pay for itself by eliminating the profit-dwarfing errors that cannot be avoided when a scale is taxed beyond its capacity.

One of our representatives would like to tell you more about the Type "S" Auto Truck Scale. Or mail the coupon below for an interesting booklet and Type "S" specifications.

FAIRBANKS SCALES

Preferred the *World Over*

NEW YORK
Broome and Lafayette Sts.

CHICAGO
900 S. Wabash Ave.

And forty other principal cities in the United States
Coupon brings free booklet

(Mail to office most convenient)

Fairbanks Scales, Dept. S-B-10
Broome and Lafayette Sts., New York
900 S. Wabash Ave., Chicago

Please send copy of the Booklet "A Talk on Scales"; also Type "S" specifications.

Name .....

Address .....

Company .....

Free Service to our readers

For the convenience of readers who are in the market for equipment, our "Free Service" department will furnish on request any information, catalogs and prices on any machinery, equipment or supplies used in pits and quarries. The coupon below makes it easy for you. Simply check, sign and mail.

Pit & Quarry, Rand McNally Bldg., Chicago, Ill.

Pit and Quarry, Research Department,
Rand McNally Bldg., Chicago, Ill.

WE ARE IN THE MARKET for the items checked below, and would be glad to receive catalogs, prices or other information.

- ☐ Agitators
- ☐ Air Compressors
- ☐ Air Compressors, Portable
- ☐ Babbitt Metal
- ☐ Baffles
- ☐ Bag Filling Machines
- ☐ Bag Sewing Mach.
- ☐ Bags, Cotton
- ☐ Bags, Paper
- ☐ Barges
- ☐ Barrels, Steel
- ☐ Belt Fasteners
- ☐ Belting, Conveyor
- ☐ Belting, Transmission
- ☐ Bin Gates
- ☐ Bins, Clay Tile Storage
- ☐ Bins, Concrete Storage
- ☐ Bins, Steel Storage
- ☐ Blasting Fuses
- ☐ Blasting Powder
- ☐ Block Machinery, Concrete
- ☐ Boiler Compound
- ☐ Boiler Skimmers
- ☐ Boilers
- ☐ Brick Machinery, Concrete
- ☐ Buckets, Conveyor
- ☐ Buckets, Grab
- ☐ Buildings, Portable
- ☐ Burners, Oil
- ☐ Cable Coatings
- ☐ Cableways
- ☐ Car Movers
- ☐ Car Pullers
- ☐ Car Replacers
- ☐ Car Wheels
- ☐ Cars, Bottom Dump (Gauge.....in.)
- ☐ Cars, End Dump (Gauge.....in.)
- ☐ Cars, Side Dump (Gauge.....in.)
- ☐ Cars, Steel Gondola
- ☐ Castings, Special Metal
- ☐ Chain Drive
- ☐ Chain, Conveyor
- ☐ Chain, Steam Shovel and Dredge
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- ☐ Chutes and Liners, Metal
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- ☐ Cranes, Locomotive
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- ☐ Crushers, Jaw
- ☐ Derrick Swingers
- ☐ Derricks
- ☐ Dippers
- ☐ Draglines, Cableway
- ☐ Draglines, Revolving Boom

(Continued on next page)

- ☐ Dragline, Scraper
- ☐ Dredges, Dipper
- ☐ Dredges, Land
- ☐ Dredges, Sand Suction
- ☐ Drill Steel
- ☐ Drilling Contractors
- ☐ Drill Sharpening Machines
- ☐ Drills, Blast Hole
- ☐ Drills, Hand Hammer
- ☐ Drills, Tripod
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- ☐ Elevating Equipment
- ☐ Engineering Service
- ☐ Engines, Gasoline (H. P.....)
- ☐ Engines, Gasoline Portable Power Unit (H. P.....)
- ☐ Engines, Hoisting
- ☐ Engines, Hydraulic Pumping
- ☐ Engines, Oil (H. P.....)
- ☐ Engines, Power Plant
- ☐ Engines, Steam
- ☐ Feeders
- ☐ Fire Alarms
- ☐ Fire Alarm Systems

To be used for.....

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Firm Name.....

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City ..... State.....

- ☐ Fire Brick
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- ☐ Gears
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- ☐ Grapple, Stone
- ☐ Grate Bars
- ☐ Grates
- ☐ Gypsum Separators
- ☐ Hoisting Engines
- ☐ Hoists, Chain
- ☐ Hoists, Derrick
- ☐ Hoists, Drum
- ☐ Hose, Sand Suction
- ☐ Hydrators
- ☐ Hydraulic Mining Nozzles
- ☐ Hydraulic Pipe
- ☐ Hydraulic Pumping Engines
- ☐ Hydraulic Valves (Pulpit and Indicator)
- ☐ Idlers, Belt Conveyor
- ☐ Industrial Railway Systems
- ☐ Kettles
- ☐ Kilns, Cement
- ☐ Kilns, Lime
- ☐ Lights, Carbide
- ☐ Linings, Bag and Barrel
- ☐ Loaders, Bin, Portable
- ☐ Loaders, Boom and Bucket
- ☐ Loaders, Box Car
- ☐ Loaders, Conveyor
- ☐ Locomotives, Electric (Gauge .....in.)
- ☐ Locomotives, Gasoline (Gauge .....in.)
- ☐ Locomotives, Steam (Gauge .....in.)
- ☐ Locomotives, Storage Battery (Gauge .....in.)
- ☐ Log Washers
- ☐ Lubricators
- ☐ Magnetic Separators
- ☐ Manganese Steel
- ☐ Manganese Steel Parts
- ☐ Metal, Babbitt
- ☐ Metal, Perforated
- ☐ Meters
- ☐ Mills, Chaser
- ☐ Mills, Tube
- ☐ Mixers, Concrete
- ☐ Mixers, Plaster
- ☐ Motors, Electric (H. P.....)
- ☐ Motors, Gasoline (H. P.....)
- ☐ Motors, Gasoline Portable Power Unit (H. P.....)
- ☐ Motor Truck Dump Bodies
- ☐ Motor Trucks
- ☐ Nozzles, Hydraulic Mining
- ☐ Nozzles, Suction Screen
- ☐ Oil Burners
- ☐ Oils and Lubricants
- ☐ Perforated Metal
- ☐ Picks and Shovels
- ☐ Pipe, Hydraulic
- ☐ Pipe, Iron
- ☐ Pipe, Spiral
- ☐ Plows
- ☐ Post Molds, Concrete
- ☐ Powder, Blasting
- ☐ Powder Magazines, Steel
- ☐ Power Transmitting Equipment
- ☐ Power Unit, Gasoline, Portable (H. P.....)
- ☐ Pulverizers, Hammer
- ☐ Pulverizers, Ring
- ☐ Pulverizers, Roll
- ☐ Pump Repairs
- ☐ Pumps, Drainage
- ☐ Pumps, Dredging
- ☐ Pumps, Sand
- ☐ Pumps, Water Supply
- ☐ Pyrometers
- ☐ Rail, Steel
- ☐ Roofing and Siding (Iron, Steel, Zinc)
- ☐ Rope, Manila
- ☐ Rope, Wire
- ☐ Sand-Lime Brick Machinery
- ☐ Scales, Automatic, Conveyor
- ☐ Scales, Track
- ☐ Scrapers, Power
- ☐ Scrapers, Team
- ☐ Screening Equipment

(See other side)

- ☐ Screens, Perforated Metal
- ☐ Screens, Rotary
- ☐ Screens, Vibrating
- ☐ Separators, Air
- ☐ Separators, Gypsum
- ☐ Separators, Magnetic
- ☐ Separators, Sand
- ☐ Sheaves
- ☐ Shovels, Electric (.....yd.)
- ☐ Shovels, Gasoline (.....yd.)
- ☐ Shovels, Steam (.....yd.)
- ☐ Speed Reducers
- ☐ Steel Barrels
- ☐ Steel, Drill
- ☐ Steel, High Speed
- ☐ Steel, Manganese
- ☐ Steel, Structural
- ☐ Stokers, Automatic
- ☐ Stone Grapple
- ☐ Stripping Equipment, Power
- ☐ Superheaters
- ☐ Swinger, Derrick
- ☐ Tachometers
- ☐ Tackle Blocks
- ☐ Tampers, Concrete Block
- ☐ Tanks, Settling
- ☐ Tanks, Steel
- ☐ Tanks, Wood
- ☐ Ties and Timbers
- ☐ Tile Machinery, Concrete
- ☐ Track
- ☐ Track Scales
- ☐ Track Shifters
- ☐ Tractors, Caterpillar
- ☐ Tramways, Aerial
- ☐ Transformers, Electric
- ☐ Trolley Carriers
- ☐ Trucks, Electric
- ☐ Tube Mills
- ☐ Turbines
- ☐ Unloaders, Bin
- ☐ Unloaders, Boom and Bucket
- ☐ Unloaders, Conveyor
- ☐ Wagons, Dump
- ☐ Washers, Log
- ☐ Washing Equipment
- ☐ Welding Equipment
- ☐ Winches
- ☐ Wire Cloth

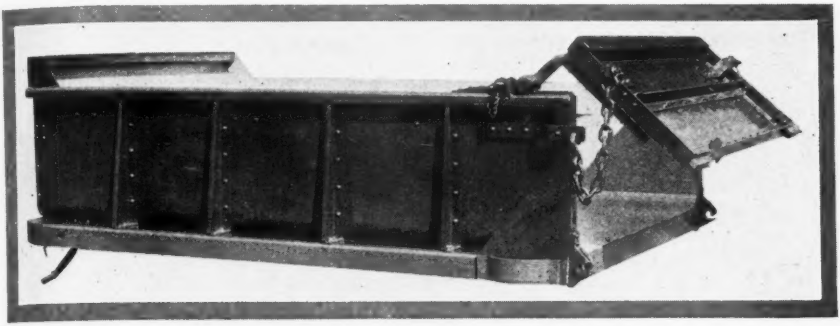
To be used for.....

.....

Firm Name.....

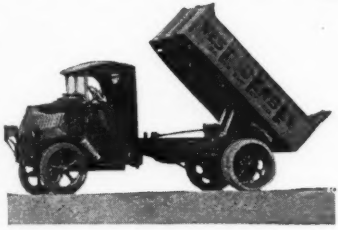
Address .....

City ..... State.....



Heil Body Model 32 is designed for truck owners who want a steel dump body built to stand up under the toughest hauling conditions of Pit and Quarry work.

Heil Dumps Bring Profits



Twin Cylinders Twice the Power

The Heil Hoist will lift anything your truck will carry. Two pistons of solid steel raise the body to the highest dumping angles. No danger of back-tipping or side-sway.

The Heil Hoist occupies no loading space, is easy to mount and easier to operate. Two levers in the cab control the raising and lowering of the hoist—it can be held at any dump angle.

Heil also makes a complete line of Dump Bodies and Hoists for the Ford truck. Ask for Bulletin 150.

IN THE pit and out. Always on the job to do the job right. Bodies and Hoists built to stand the gaff of the heaviest loading and unloading work. Ask the West Jersey Sand and Gravel Co., their fleet of fifteen has given service plus.

Heil Dumps mount on any make or model motor truck. Made for hauling sand, gravel, crushed stone, concrete, clay, cinders, coal, ashes, rubbish and for every hauling purpose. Note how well Dump Body No. 32, shown above, is reinforced with gusset plates and braces. The tailgate is protected by a bumper bar on each side.

Send in the coupon below for Catalog describing all Heil Dump Body and Hoist Models.

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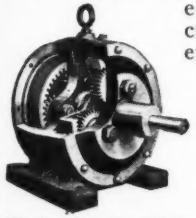

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Sales offices in all principal cities in U. S. and Canada

Pit and Quarry

Index to Advertisers

VOL. 11 CHICAGO, ILL., OCTOBER 1, 1925 No. 1

Pit and Quarry

A Semi-Monthly Publication for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime and Other Non-Metallic Minerals.

VOL. 11 CHICAGO, ILL., OCTOBER 1, 1925 No. 1

FEATURE CONTENTS

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2—A Barber-Greene "U" unloading a box car of anthracite in 4 hours for the Lorr Brothers Coal Company, Chicago. Wheeling is eliminated and but two helpers are used.

Tear this out and send for "Mr. Barber's Scrapbook" and complete information on the "U" Conveyor.

Name.....

Address.....

City.....

State.....

1—An electric driven "U" loading wagons for the Consumer's Company, Chicago. Notice how easily two men can keep the machine going to capacity.

3—A series of Barber-Greene "U" Conveyors handling oyster shell for the H. C. Rowe Co.

4—A "U" loading sand in a sand pit. Notice how the sand is screened. One man loads 3 yards in 15 minutes. Two men load 3 yards in 5 minutes.

5—A Barber-Greene "U" loading brick into trucks from a kiln for the Onondaga Brick & Tile Co., Onondaga, New York.

$448 That Tell High Handling Costs Good-bye

What the low price of $448.00 for the Barber-Greene "U" equipped with a 3 phase, 60 cycle, 220 volt, electric motor, means is almost self evident.

For an exceptionally low investment from two to ten men, depending upon the routine of the work, can be eliminated from the yard gang payroll. With competition as keen as it is, such a reduction of handling costs, and hence production costs, is obviously desirable.

For instance, the Barber-Greene "U" reduces the car unloading gang to one or two men. It has a cleated belt—and a low charging end that can be easily nosed beneath hopper-bottomed cars. These two features help the Barber-Greene "U" to unload from 200 to 400 tons of coal, or a proportionate quantity of gravel or other materials, per day.

That means good-bye to slow, inefficient unloading—good-bye to high unloading costs—good-bye to excessive labor turnover—good-bye to an extra production charge.

The Barber-Greene conveying belt is edged with clips that provide a troughing effect, and eliminate wear between the belt edge and the conveyor frame. Two steel channels make a husky, rigid conveyor frame.

The Barber-Greene "U" is a he-man conveyor in a small size. Its cleated belt carries the large lumps that the ordinary baby conveyor can't handle. The discharge end can be quickly raised from five to twelve feet. That reach enables it to fill ordinary bins, build small stock piles, work into sheds, and to load trucks or cars.

Now check all these things against the price of $448.00. Check the men that can be saved, check the features that assure long life and fast handling. Then check the coupon for additional information on this fast, low-priced conveyor.

The Barber-Greene "U" may also be had equipped with a 4 h. p., Fuller Johnson, gas engine, $485.00, or with an electric motor that meets your needs. Prices on different types of power vary slightly, and are reflected in the price to the user.

BARBER-GREENE COMPANY, 490 West Park Ave., Aurora, Ill.

Representatives in fifty cities

BARBER GREENE

Portable Belt Conveyors Self Feeding Bucket Loaders

Coal Loaders . . . Automatic Ditch Diggers . . Coal Feeders

Pit and Quarry

Vol. 11 Chicago, Ill., October 1, 1925 No. 1

Something to Think About

CONSIDERING the recent hearing by the Interstate Commerce Commission held in Chicago for several days starting September 9th, we see cause for concern on the part of the non-metallic mineral industries. It was decidedly evident that the Commission will attempt to accomplish the purport of the Hoch Smith Resolution, namely, to reduce the freight rates on agricultural products. It could also be seen that this cannot be accomplished at the expense of the railroads but will necessarily be at the expense of other industries.

Everything presented during the hearing involved the farmer's attitude and the railroad's attitude. Those presenting the railroad's position were aware that the farmer would be the chief obstacle to overcome in any freight rate increase in the western territory. The Hoch Smith Resolution ordered the investigation in the hope that the freight on farm products could be reduced. Bankers, railroad officials and economists were presented to testify before the Interstate Commerce Commission that the farmer is financially able to pay the desired freight increase. While it is generally recognized that the farmer is returning to a stage of prosperity, it must be remembered that he has not fully recovered from his recent depression; that he will resist with great force any action that impedes full recovery; that the general investigation was ordered largely for his benefit because of his political influence; and that about the time the Commission will be through with its investigation the national political issues will again be before the country and the political advantage of the farmer will be enhanced.

There is so little chance that the Hoch Smith Resolution will be repealed that we urge more consideration of the problem involved. The following quotation shows clearly the agricultural background of the issue:

"In view of the existing depression in agriculture, the Commission is hereby directed to effect with the least practicable delay such lawful changes in the rate structure of the country as will promote the freedom of movement by common carriers of the products of agriculture affected by that depression, including livestock, at the lowest possible lawful rates compatible with the maintenance of adequate transportation service: Provided, That no investigation or proceeding resulting from the adoption of this resolution shall be permitted to delay the decision of cases now pending before the Commission involving rates on products of agriculture, and that such cases shall be decided in accordance with this resolution."

Farm products represent an important portion of the tonnage of western railroads, and so the hearing held in Chicago offered an opportunity to study the part the farmer will actually play in the Commission's endeavor to carry out the intent of the Hoch Smith Resolution. As a result of our attendance at this hearing and contact with the varying interests present, we believe that the position of the farmer has not been affected by all the testimony offered. It is reasonably certain that he will not be asked to take an increase, and it is still likely that he will have something in the way of a reduction. The purpose and intent of the Hoch Smith Resolution has to be upset before the decrease in rate in agricultural products can be denied. If reductions are made in rates on agricultural products, it will necessitate increasing the rates on other commodities. Such increases would naturally be passed along to those commodities which offer the least resistance. In this class will be found the non-metallic industries as compared to the resistance of the packing, lumber, coal, automobile

industries, which have consistently fought in an organized manner the freight rate structure as it affected them.

The other alarming factor was the conclusive evidence offered by the western railroads in support of their contention that they are in need of a general increase in freight rates. The Transportation Act of 1920 was intended to assure the carriers a fair return upon the value of their properties, and not since the act was passed have the majority of the railroads enjoyed the return allowed. The commissioner in charge of the hearing indicated, by various questions directed at several officials, an interest in the proposed plan to have all the railroads pool the earnings resulting from a freight increase. In the questions we recognized that the plight of the railroads is appreciated, that a probable increase is recognized, and that this increase might be kept to a minimum by a system of pooling the earnings resulting. The railroads seemed decidedly opposed to a pooling of the earnings resulting from an increase. That is a problem of the railroads. The fact that an increase is more or less recognized as a necessity is something of interest to the non-metallic mineral industries. We now have the possibility of a general increase in freight rates with the exception of the rates on farm products. The burden might even be increased by allowing a decrease on farm products also. It is entirely possible that the Commission would order a pooling system of the earnings from a general increase to apply over the national railroad system.

The necessity for a general rate increase for the western railroads at least has been proven by facts to be necessary. The natural feeling is that if there are any increases on any products, there should be increases on all. Here again the non-metallic mineral industries would probably have an increase out of proportion with the other industries. This would result from the resistance that these other industries would offer as they have in the past.

It seems to us that those industries, which have consistenly resisted freight rate increases and have diligently insisted that the railroads understand their problems, have done so at a profit to themselves in so far as freight rates are concerned.

Rates should be proportionate to the service rendered and not according to the shipper ability to pay. Because we believe that even the present rates in general in effect on the products of the non-metallic mineral industries are high in proportion to the service rendered other industries for the equivalent rate, we maintain that not only should the non-metallic mineral industries be excepted from a general increase, but also that the merits of a decrease in the present existing rates should be investigated. This can be accomplished only by presenting the facts to the Interstate Commerce Commission. This affords an opportunity for the various associations to function in an unselfish manner for the interests of their respective groups from a national standpoint.

All interests represented in the recent hearing in Chicago will meet again in Chicago on October 26th. Other hearings will be held in Minneapolis and St. Paul on November 9th, in Denver on November 16th, in San Francisco on November 23d, in Dallas on December 2nd and in Kansas City on December 14th. Final arguments in the case will be heard by the Commission as a whole in Washington. It will probably be early in the fall of 1927 before any decision will be announced. The opportunity to thwart a possible general increase in freight rates is at hand. In addition, an issue is present on which greater cooperation can be realized, which in itself is a worthy goal of any industry.

The trade associations in the non-metallic mineral industries are doing a great constructive work in stabilizing their respective groups. Their annual and semi-annual meetings have been of great benefit to many of the individual members. To our knowledge they have done practically nothing relating to this issue of freight rates. It is generally argued that associations should not adopt a legislative program. We believe this attitude should be reconsidered in light of recent decisions of the Supreme Court regarding association activities. We earnestly recommend that all associations consider the issues involved in the present freight rate investigation and that data be presented on their individual industries to the Interstate Commerce Commission to prevent an increase in freight rates on their products and to secure a reduction if possible.

An Unusual Cement Quarry Operation

By E. D. Roberts

FACILITIES have been installed in the new quarry, and the Beaver Portland Cement Company is now shipping lime rock from its quarry at Marble Mountain to its plant at Gold Hill, Oregon, a distance of about thirty miles. The development of this new quarry has been on such a scale as to suggest future expansion by this company.

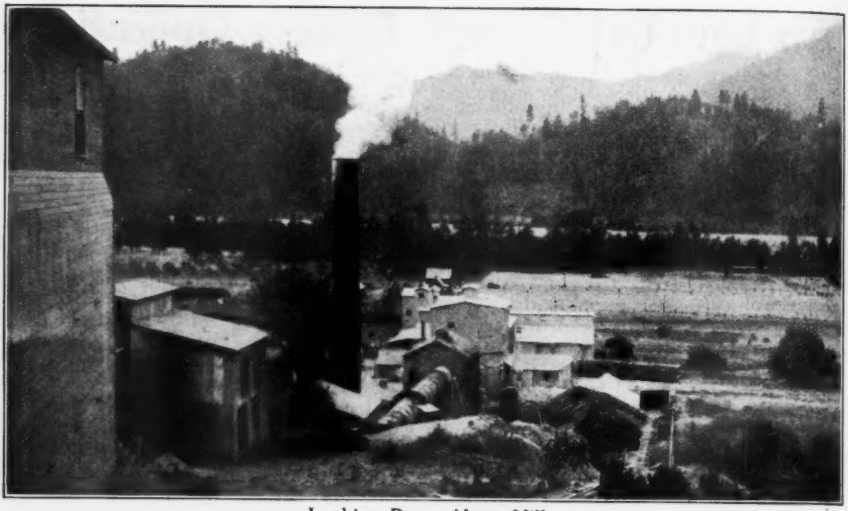
The Beaver Portland Cement Company operates a one kiln cement plant at Gold Hill, Oregon, where its shale is quarried. The lime rock was originally secured about a mile from the mill. This lime deposit was not large enough to allow the company to operate to the capacity desired and has been abondoned in favor of the new deposit at Marble Mountain. The deposit at Marble Mountain has been tested to a depth of 400 feet and extends for a distance of three miles across the country. Most of this territory has been secured by the company.

The lime rock is mined by a number 40 1½-yard Marion steam shovel which dumps the rock into 5 yard Western dump cars. These cars are handled by a 5 ton standard gauge American locomotive in trains to the crusher where the cars are side dumped into the crusher hopper.

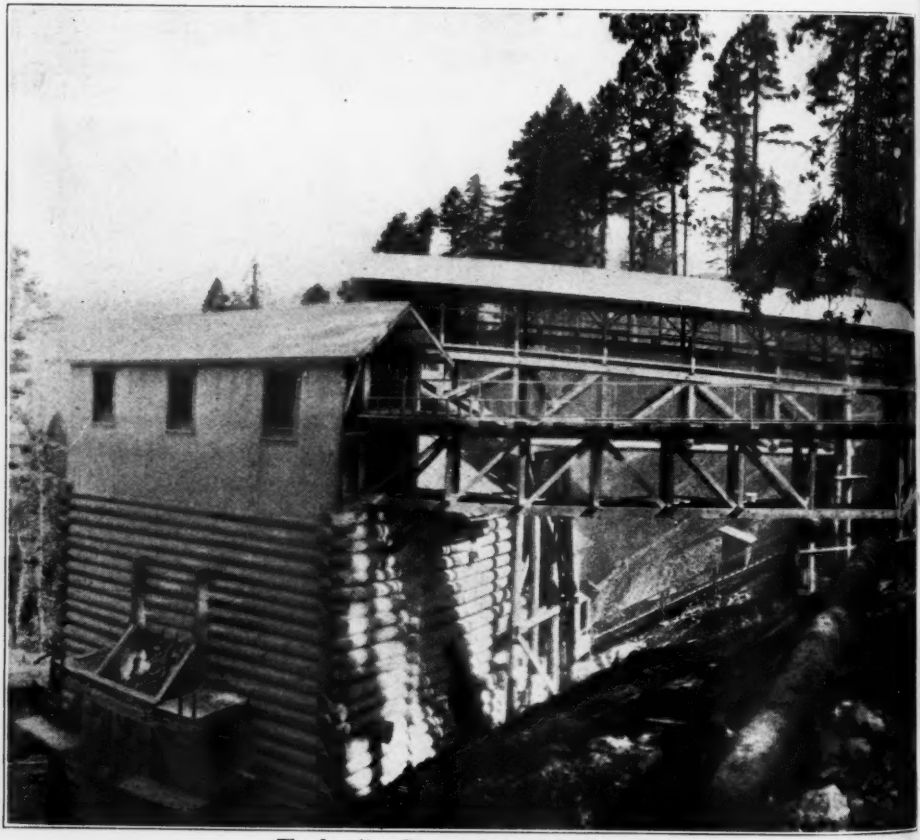
A 30 inch Traylor crusher breaks the rock to a maximum size of 4 inch, dropping it onto an inclined screen, which allows the fine particles to fall onto a belt conveyor. The large pieces of rock are divided, each stream falling into a number 5 McCully crusher which reduces the rock to 2 inch maximum and discharges onto the same belt that was mentioned above. This belt carries the crushed rock to the storage bins, which have a capacity of 500 tons.

Vertically operated ratchet gates control the flow of rock from the bins into the tram cars. These 15 ton Western dump tram cars are handled in pairs attached to a cable which

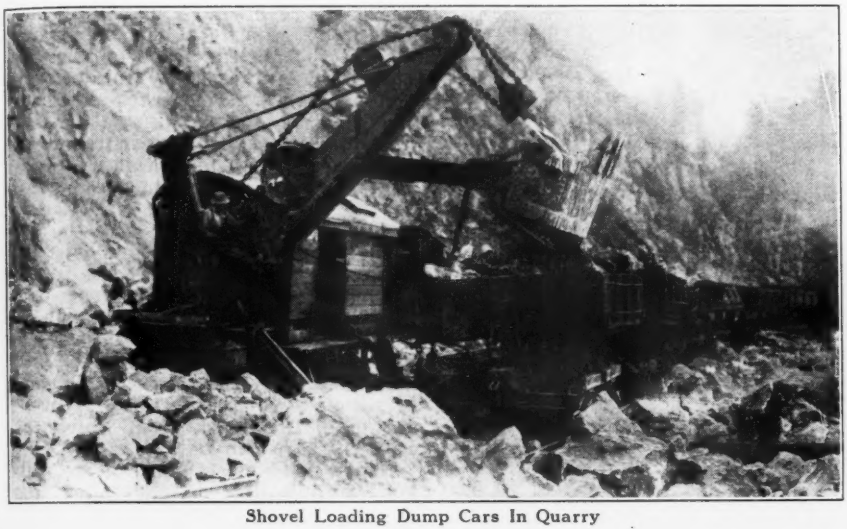
Showing the Trap Tunnel and Working Face of Quarry



Looking Down Along Mill



The Loading Bins at Left—Belt Conveyor



Shovel Loading Dump Cars In Quarry

Under Cover—Crushing Houses at Right

View Showing the Inclined Tramway

runs over the control hoist and fastens to another pair of cars. The loaded cars haul back the empty cars, but a Williamette Steel and Iron Works hoist operated by a 100 H.P. motor controls the cars. The hoist is equipped with air brakes.

A feature of the tram line which is worthy of attention is the provision at the passing track to keep the cable over on the proper line. At the center of the passing track the track is raised about two feet above the grade line of the rest of the tramway. When the car drops off this raise, the cable catches in the sheave located at the peak of the raise and keeps the cable at that point while the car is below it. The tram line is 4,500 feet in length with a difference in elevation of its ends of 1,400 feet.

At present the loaded tram cars dump directly into the standard gauge cars below the end of the tram. Provision has been made for sufficient elevation to construct storage bins at the main line track from which the railroad cars can be loaded.

Three miles of standard gauge railroad were built from the end of the tramway to the terminus of the California and Oregon Coast Railroad. They have named this new railroad the Marble Mountain Railroad. The California and Oregon Coast Railroad hauls the rock to Grants Pass where the cars are turned over to the Southern Pacific Railroad Company which completes the haul to Gold Hill.

The steam shovel is now working on a face which will develop into a 400 foot height for 1,000 feet in length. Additional development is provided by a 14 x 14 foot tunnel for trapping the rock into the cars in case of shovel trouble. This trap tun-

Car of Oil Shale Coming from Trap Tunnel

ñel will produce 300 tons of rock on one shift working on a 300 foot face.

Mr. C. W. Martin, Superintendent of the plant, designed and superintended the construction of the quarry development which with the railroad required eight months to construct.

Arriving at the plant in bottom dump railroad cars, a spot is made over a reinforced concrete hopper, and the rock is dumped into it and drawn from there into a 2 yard car which is hauled up an incline to the top of the raw mill where it is dumped into the lime rock bins to be drawn off as desired. In case the raw mill bins are full, the cars are spotted on a trestle 200 feet long and the rock bottom dumped through to storage. A 10 ton Brownhoist locomotive crane moves the rock back from the track if extensive storage is required. A considerable storage is maintained here for reclaiming by the Brownhoist locomotive crane if the regular supply is curtailed or shut off for any reason.

Shale is quarried by the "Sweede trap tunnel" method from the hillside above the plant. The cars dump it directly into a Gates crusher for preliminary grinding after which a bucket elevator deposits it into the raw shale bin.

At present, development work is in progress to secure a supply of silica rock for sweetening purposes. This is also secured from the hillside above the plant and will be hauled by cars to the Gates crusher used for the shale where it will be broken to the desired size.

Gypsum comes from Nevada and is unloaded and handled by the locomotive crane. This crane also spreads the hot clinker on the clinker pile and reclaims it as required, dropping it with the proper amount of gypsum into a hopper feeding the dry mills.

The plant has been given considerable help by gravity and very few elevators are required. A 10 x 200 foot Allis Chalmers kiln discharges directly into the open air although a 60 foot cooler is installed. It is thought that the clinker grinds more easily by air cooling and water quenching than by running it through a cooler.

Allis Chalmers ball and tube mills are used for the wet grinding while a Sturtevant duplex mill and 3 Allis Chalmers tube mills are used for the finish grinding.

The cement is stored in wooden silos having a capacity of 50,000 barrels of cement. Shipments are made either by truck or railroad. A three tube Bates packer sacks the cement which is dropped onto a belt conveyor which carries the sacks to the car and past a sack counter. This sack counter utilizes a productometer which records the number of sacks passing the point. Readings of the productometer are made before and after loading each car. The difference between the two readings minus the rejects gives the number of sacks in the car. The trucker also makes a check of the car, which is recorded, giving a very "foolproof" way of knowing and being able to stand by the number of sacks billed in the car.

Mr. D. L. Carpenter is President and General Manager; Mr. W. H. Muirhead is Vice President and Treasurer; Mr. L. H. Adams is Secretary; Mr. Buel C. Nelson, Assistant Secretary; Mr. C. W. Martin, Superintendent; Mr. L. L. Smith, Chief Chemist, and Mr. J. M. Macleay, Sales Manager. Portland offices are maintained at 1110 Porter Building, while the plant address is Gold Hill, Oregon.

Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney. Continental Trust Building, Washington. D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,553,063. Directly-driven slewing-gear for drag-line excavators. Oswald Bedgood, Glasgow, Scotland, assignor to Lobnitz & Co., Ltd., Renfrew, Scotland.

1,553,096. Tooth-connection for excavating implements. Walter J. Mullally, Chicago Heights, Ill., assignor to American Manganese Steel Co., Chicago, Ill.

1,553,202. Crushing-head. Edgar B. Symons, Los Angeles, Cal., assignor to Symons Brothers Co., Milwaukee, Wis.

1,553,203. Spring-head adjustment for disk-crushers. Edgar B. Symons, Los Angeles, Cal., assignor to Symons Brothers Co., Milwaukee, Wis.

1,553,293. Sledge-mill. Thomas J. Sturtevant. Wellesley, Mass., assignor to Sturtevant Mill Co., Boston, Mass.

Portland Cement Output in August, 1925

Production and shipments of Portland cement during the month of August were the highest ever recorded for any month in the industry, according to statistics compiled by the Bureau of Mines, Department of Commerce. Production shows an increase of more than 8 per cent and shipments of 9 per cent over August, 1924. Portland cement stocks continue the seasonal decline but are nearly 12 per cent greater than in August, 1924.

Production, shipments, and stocks of finished Portland cement. by districts, in August. 1924 and 1925, and stocks in July, 1925. in barrels.

Commercial District	Production August		Shipments August		Stocks at end of August		Stocks at end of July
	1924	1925	1924	1924	1924	1925	1925*a*
Eastern Pa., N. J. and Md.	3,621,000	3,726,000	4,263,000	4,402,000	2,092,000	1,784,000	2,460,000
New York	803,000	867,000	942,000	1,001,000	645,000	623,000	757,000
Ohio, Western Pa. and W. Va.	1,707,000	1,810,000	1,882,000	1,905,000	1,018,000	1,517,000	1,612,000
Mich.	1,105,000	1,192,000	1,175,000	1,285,000	521,000	873,000	967,000
Wis.*b*, Ill., Ind. and Ky.	2,133,000	2,425,000	2,529,000	2,914,000	1,554,000	2,122,000	2,611,000
Va., Tenn., Ala. and Ga.	1,049,000	1,302,000	1,241,000	1,263,000	414,000	303,000	264,000
Easter Mo., Ia., Minn. and S. Dak.*c*	1,596,000	1,632,000	1,660,000	1,952,000	2,046,000	2,080,000	2,399,000
Western Mo., Neb., Kans. and Okla.	1,033,000	1,170,000	1,036,000	1,268,000	1,142,000	1,430,000	1,529,000
Texas	414,000	481,000	433,000	452,000	245,000	262,000	232,000
Colo. and Utah	283,000	210,000	259,000	230,000	191,000	362,000	382,000
California	1,063,000	1,181,000	1,056,000	1,234,000	334,000	381,000	435,000
Ore., Wash. and Mont.	321,000	423,000	379,000	447,000	464,000	194,000	248,000
	15,128,000	16,419,000	16,855,000	18,383,000	10,666,000	11,931,000	13,896,000

a. Revised. *b*. Began producing June, 1924. *c*. Began producing December, 1924, and shipping January, 1925.

Stocks of clinker, or unground cement, at the mills at the end of August, 1925, amounted to about 5,643,000 barrels compared with 6,961,000 barrels (revised) at the beginning of the month.

Production, shipments. and stocks of finished Portland cement, by months, in 1924 and 1925. in barrels.

Another new plant, located in Ohio, is included for the first time in the statistics. The following tables, prepared by the Division of Mineral Resources and Statistics of the Bureau of Mines, are based mainly on the reports of producers of Portland cement. The August, 1925, totals include estimates for two plants.

Month	Production		Shipments		Stocks at end of month	
	1924	1925	1924	1925	1924	1925
January	8,788,000	8,856,000	5,210,000	5,162,000	14,155,000	17,656,000
February	8,588,000	8,255,000	5,933,000	6,015,000	16,815,000	19,689,000
March	10,370,000	11,034,000	8,995,000	10,279,000	18,189,000	20,469,000
1st quarter	27,746,000	28,145,000	20,138,000	21,456,000	.....	.....
April	11,726,000	13,807,000	12,771,000	14,394,000	17,159,000	19,887,000
May	13,777,000	15,503,000	14,551,000	16,735,000	16,403,000	18,440,000
June	13,538,000	15,387,000	15,036,000	17,501,000	14,903,000	16,409,000
2nd quarter	39,041,000	44,697,000	42,358,000	48,630,000	.....	.....
July	14,029,000	15,641,000	16,614,000	18,131,000	12,319,000	13,896,000*a*
August	15,128,000	16,419,000	16,855,000	18,383,000	10,666,000	11,931,000
September	14,519,000	.....	16,827,000	.....	8,404,000	.....
3rd quarter	43,676,000	.....	50,296,000	.....	.....	.....
October	14,820,000	.....	17,160,000	.....	6,073,000	.....
November	13,141,000	.....	10,289,000	.....	8,928,000	.....
December	10,435,000	.....	5,506,000	.....	13,913,000	.....
4th quarter	38,596,000	.....	32,955,000	.....	.....	.....
	148,859,000	.....	145,747,000	.....	.....	.....

*a*Revised.

Transporting Sand By Aerial Tramway Over a Distance of Two Miles

By George Ransom

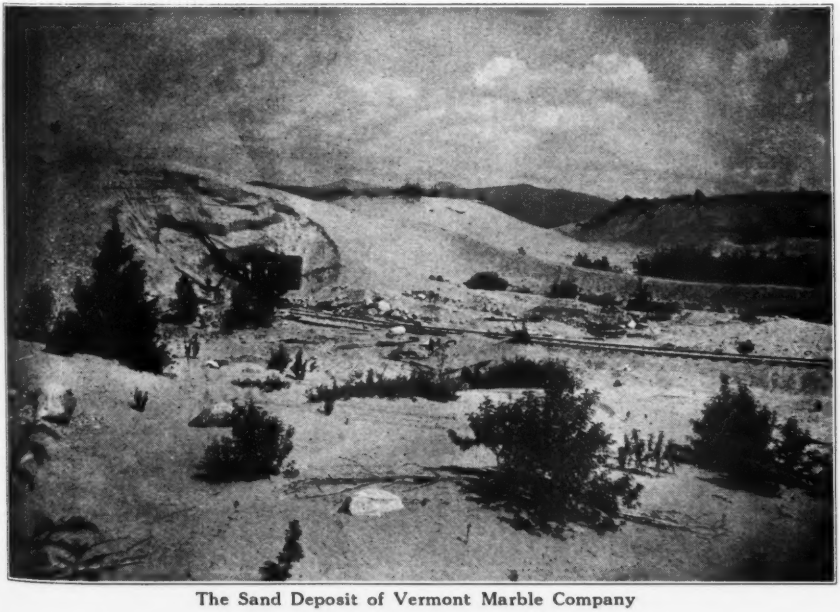
TRANSPORTING on an average 300 tons of sand a day by aerial tramway is an unusual operation in the sand and gravel industry. One of the most interesting sand producing operataions in the country, and one which transports the sand produced a distance of two miles, is carried on by the Vermont Marble Company at Proctor, Vermont. This company required sand at all of its numerous mills where the marble is cut and rubbed preparatory to being polished by means of processes which it is not necessary to enter into here.

The pits from which the sand is obtained lie on the opposite side of a ridge of hills from Proctor. The supply is apparently unlimited in quantity. This is fortunate for an amount of between 250 and 300 tons per day is required.

The great problem, therefore, is that of economical transportation. To carry such large quantities by trucking and under such conditions as prevail would, of course, be prohibitive. The distance from the mills at Proctor to the pits is about two miles in a straight line, and an aerial tramway has been constructed for the entire distance. An idea of the appearance of the line is given in the accompanying illustrations.

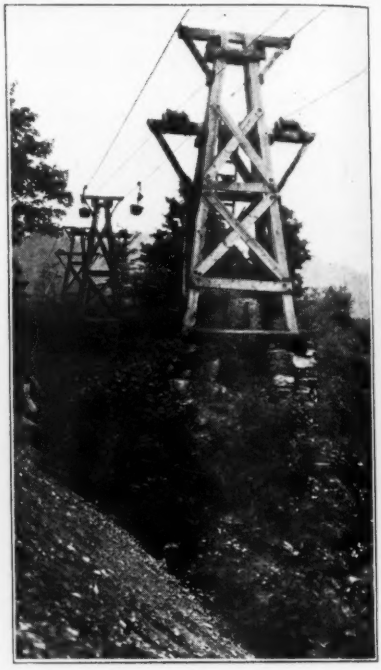
There are 52 wooden towers, the construction of which is shown in detail in the illustrations, especially in regard to the saddle for supporting the cables and the rollers below them to hold up the transmission cable. These towers vary in height from the two highest, which are 80 feet, to the lowest, which is only 15 feet.

The supporting cables are American Steel and Wire Company's transmission cable with smooth surface, 1⅛ inch in diameter on the side for loaded buckets and 1 inch in diameter on the side for the empty buckets. Both tramway cables are given a quarter turn every two weeks to prevent uneven wearing. All pulleys and idlers are greased every week. The endless transmission cable by means of which the buckets are pulled is ⅝ inch in diameter.



The Sand Deposit of Vermont Marble Company

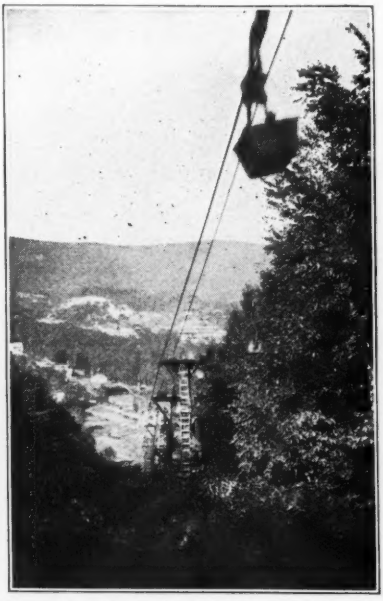
View Showing the Tower Construction



The Tower Line-Up for Tramway

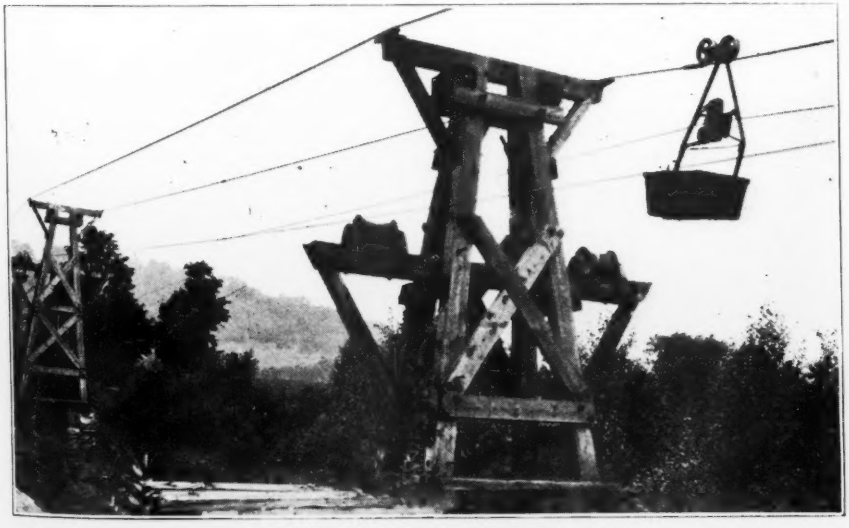
View in the Sand Pit

View of Tramway on Mountainside



Note How Path Has Been Cut Through

The buckets carry five hundred pounds of sand each, and they depart and arrive approximately every 27 to 30 seconds, thus delivering one ton about every two minutes. To do this they travel at the rate of 500 feet per minute and are spaced 200 feet apart on the transmission cable. As the load is carried over the range of hills, the buckets on the down grade help to pull those on the up grade, so that the whole line consisting of about 50 loaded buckets and an equal number of empties is moved by a 25 H. P. mo-



View Showing Detail of Tower and Buckets

View of Screening Plant—At Right Is Grizzly—Belt Conveyor Under Grizzly Elevates the Sand

tor. In fact, if it were not for starting friction, a motor of about half the size would suffice.

At the Proctor end of the line every means has been taken to save labor in handling the sand. Some of it is used in the mills at that point, so an overhead monorail has been provided on to which buckets may be switched from the cableway as they pass over the building where most of it is needed. The sand is dumped into bins, whence it is drawn when required.

In addition to this some five carloads per day are shipped by railroad to the company's other mills at West Rutland, Center Rutland, and elsewhere. The sand for this is dumped into bins

View In Sand Pit Showing Railroad Tracks

View Showing Shed on Top of Building Where Some of Sand Is Dumped

over a railroad siding, from which the cars are loaded from chutes by gravity.

The sand pits, or beds, cover a large area and are some 15 to 20 feet deep. The sand is taken out by means of an electric shovel, Type O, made by the The Automatic Shovel Company, and is placed directly into dump cars of about 1 ton capacity by the shovel and hauled by a Plymouth gasoline locomotive to the screens over narrow gauge tracks extending back to the building where the buckets of the aerial tramway are loaded. The shovel is moved from place to place under its own power. While in

Chute for Gravel from Hummer Screen

the pits it is necessary for the wheels to rest on wooden platforms, or panels. Three of these are provided. There is one for the two wheels on each side, or end, and the third is placed alongside the others in the direction in which the shovel is to be moved.

The sand is first dumped into a grizzly, reached by an inclined trestle, which sifts out the few cobbles which occur in this bed. The stones roll off to one side, and the sand falls onto a belt conveyor. This conveyor carries the sand up to a Hummer screen, which separates out the gravel. This also occurs in only comparatively small quantities. It passes from the screen through a chute to a belt conveyor, which carries it up an incline from which it is dropped off at various places. The incline itself is movable so that the gravel may be piled up over a considerable area. The waste material, cobbles and gravel, are excellent for road work or filling in and will undoubtedly be used for these purposes.

The sand drops from the Hummer screen into bins, from which it is drawn by gravity through chutes directly into the bucket conveyors. The aerial tramway enters the building where these bins are located. As the buckets approach the bins, they are released from the transmission cable and pushed by hand along an overhead monorail under the chute. When loaded they are again pushed by hand to a man who, at intervals of about 30 seconds, pushes them on to the cableway, where they automatically engage with the transmission cable and start on their journey to Proctor. The monorail is inclined downwards in the direction in which the buckets are pushed.

With all this automatic labor saving machinery it is possible to dig and start on their way to Proctor the 275 tons (approximately) of sand per day with surprisingly few men. These are as follows:

The engineer for the electric shovel and helper,
The engineer for the gasoline dinkey engine,
Two men to load the buckets,
One man to send off the buckets,
Two common laborers to help in any way that is required,
Foreman.

This number is subject to some slight variation as, for instance, when a new bed is being opened, one or two more men may be required.

There is direct telephone connection between the sand pit and the man who controls the motor for operating the transmission cable at Proctor. This motor is equipped with an automatic compensator with push button control; and the push button is located adjacent to the telephone set, so that the man at Proctor can stop the buckets instantly without leaving the telephone if anything goes wrong.

As the mills which use the sand from these pits are kept going all winter, it is of course necessary to operate the pits steadily the year around. From this point of view the aerial tramway is the ideal method of transportation because it is entirely independent of the conditions of the roads, which are naturally subject to all the vicissitudes of hard winter weather.

A Dynamite Motion Picture

A one-reel motion picture entitled "Letting Dynamite Do It," has just been made by the Explosives Department of E. I. du Pont de Nemours & Company and can be had for distribution on application to the company. The scenes show the use of explosives in many lines of industry and under many conditions. Practically every part of the country has been combed for pictures showing the employment of dynamite, all of which are picturesque and many sensational. There are views of the use of dynamite in the lumber camps of the Pacific Northwest, where the explosive is used to cut off the tops of tall trees and break log jams; also scenes on the Mexican border, where a small mountain is converted into railroad ballast through the employment of thousands of pounds of dynamite. Other scenes show how reefs were blasted away in a Florida harbor, building a swimming pool in the East, taking out concrete foundations in the midst of a great plant without so much as breaking a window, and demolishing in a few minutes a disused blast furnace many feet in height. There are also scenes of the use of explosives in building roads in the West, the unusual application of dynamite in chipping out figures on Stone Mountain, where the great Confederate Memorial is being built, and then the spectacular feat of completely demolishing an old stone intake in Lake Michigan at Chicago which was a menace to navigation. This one reel picture is the second volume issued by the du Pont Company showing the use of dynamite in various operations throughout the country.

New Standard Gypsum Plant At Seattle

By E. D. Roberts

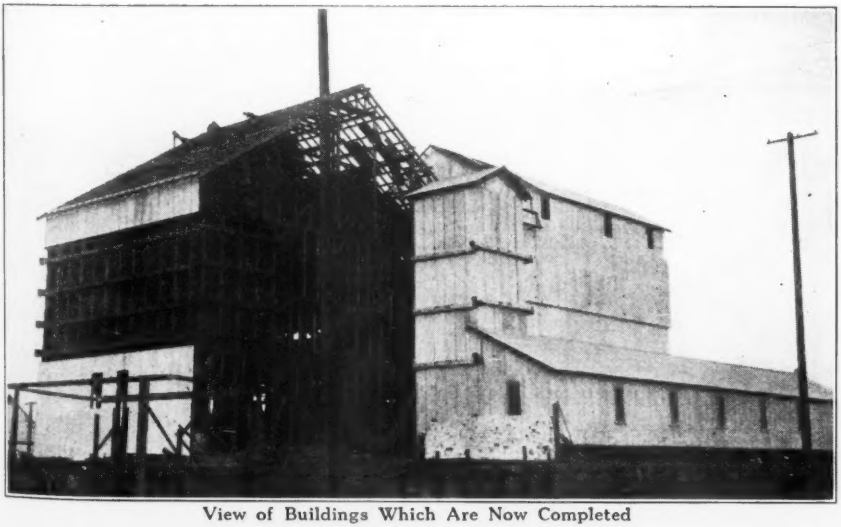
CONSTRUCTION of a two kettle plaster plant for the manufacture of plaster and allied products has now been completed and will soon be in operation on Harbor Island in the City of Seattle, Washington. The Standard Gypsum Company now operates a four kettle plant at Ludwig, Nevada, where they have made such a good showing that they have gone ahead with the present program for expansion, which calls for the construction of a three kettle plant at Long Beach, California.

The gypsum rock will be purchased from the Company Occidental Mexicana and brought from the Island of San Marcos in the Gulf of Lower California in ships chartered for the purpose. They hope to handle the rock in their own ships in order that there will be no likelihood of anyone's chartering the ships away from them.

Dockage for the unloading of the rock has been provided for by a new dock 120 feet long, fronting on what is called West Waterway. Here the boats will be unloaded by a movable gantry crane operating on the dock. The rock will be dumped into a movable hopper which is located over a 30-inch belt conveyor constructed along the face of the dock just below the floor level. This belt discharges onto an inclined 30-inch belt operating at right angles to the first one, which carries the rock up to the top of a trestle 40 feet in height constructed over the storage area. A traveling tripper discharges the rock to the pile below. The stock pile will be 40 feet in height and 295 feet long with a capacity of 20,000 tons of gypsum rock. About half of this is live storage, which will flow to the openings in the top of the tunnel constructed along the center of the stock pile.

The stock pile is enclosed by a corrugated iron building to keep the rock dry. The Seattle climate is wet a great deal of the time and causes the rock to gum up in the mills. If not kept dry, it would be necessary to dry it before milling.

The 6x8 foot tunnel underneath the stock pile is equipped with 30 sliding gates to draw off the rock onto the 18-inch reclamation belt, which carries the rock to a rotary Ehrsam crusher which reduces it to a 1 inch maximum. The crusher discharges onto another 18-inch belt which carries it up an incline and over the crude ore bin, into which it is discharged by a traveling tripper. This bin has a capacity of 500 tons of rock. It is located in the top of the mill building, which is constructed of timber and into which the bin has been constructed. The side and hoppered

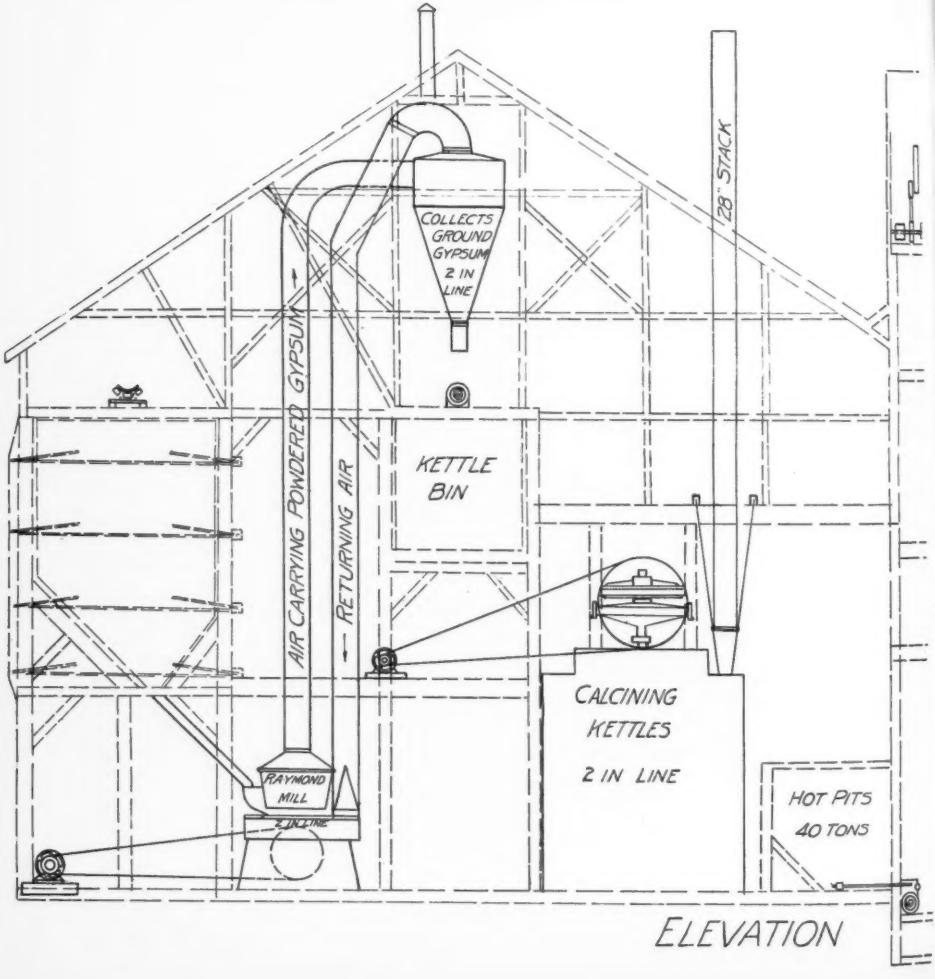


View of Buildings Which Are Now Completed

bottoms of all the bins as well as the floors are constructed of two layers of boards with a layer of tar paper between them.

The rock is drawn by gravity to the feeders on the two Raymond 5 roller mills which pulverize the gypsum. The material is discharged from the mills by means of an exhauster fan and collected in a dust collector located in the top of the building over the kettle bin. The dust collectors discharge into a screw conveyor, which distributes the powdered gypsum along the kettle bin or conveys it over a bridge and discharges it into the land plaster bin. If sold as land plaster, it is sacked by a Bates packer located under the land plaster bin. The sacked product will be trucked directly into cars or to trucks.

The pulverized gypsum is drawn off from the kettle bins by means of 4 screw conveyors located underneath the bin and discharges into two Ehrsam calcining kettles in pairs. These kettles hold ten tons at a time and are agitated by mechanical agitators during the period of calcination. The heat for calcining is supplied by oil burners using the General Electric centrifugal blower. After the proper amount of water has been driven off, the gypsum is discharged

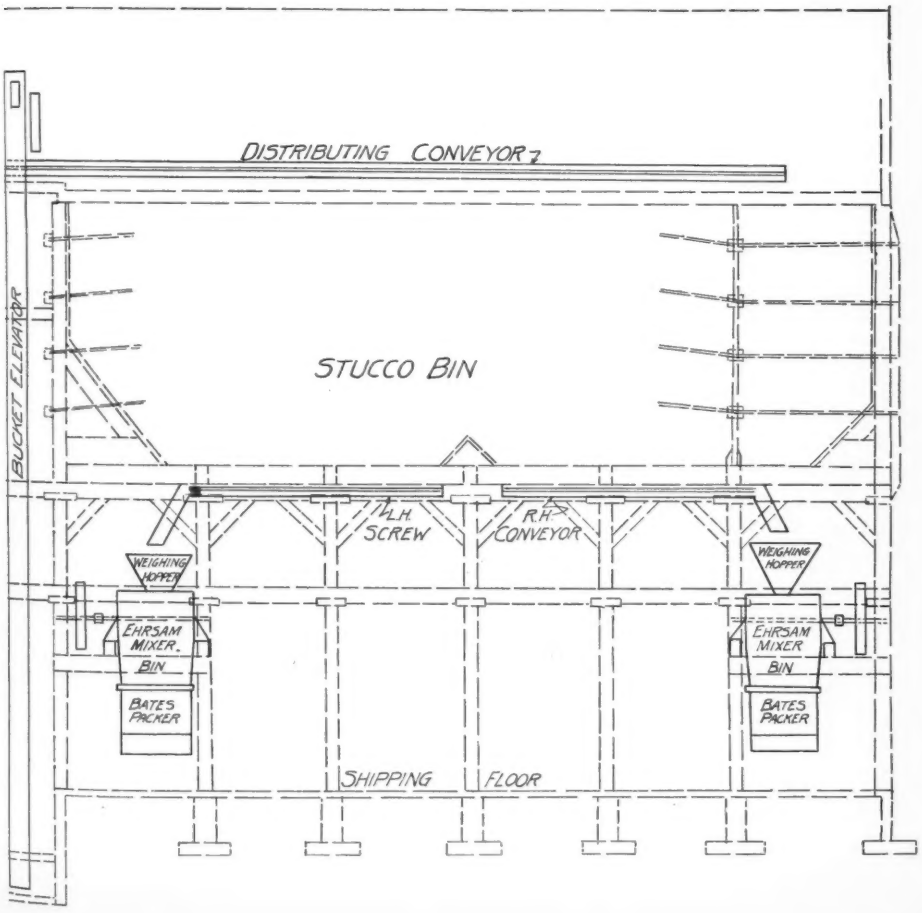


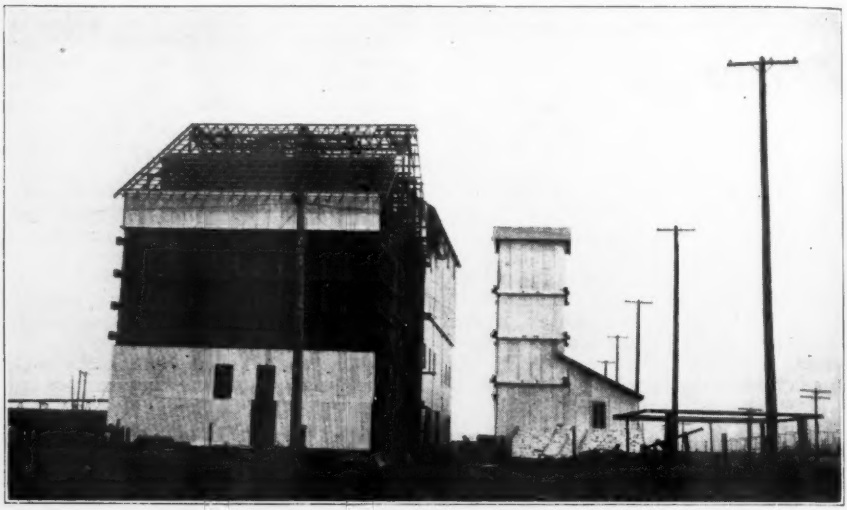
into a hot pit, one for each kettle holding 20 tons each.

Eight 6-inch screw conveyors located in the bottom of the hot pit discharge the material from the pit into a 12-inch cross screw conveyor, which carries it to a bucket elevator with 10x12 inch buckets. This elevator discharges into a screw conveyor operating along the top of the stucco bin in the top of the stucco building. This conveyor distributes the material along the bin which holds 500 tons of stucco. The stucco bin is hoppered to the center, under which are placed right and left hand screw conveyors that draw off the stucco and carry it to one of the mixers located at either end of the building.

The conveyor discharges into an automatic weighing hopper holding one ton of material. The retarder is added in the right proportions and the mixing is done by a one ton Ehrsam mixer located directly under the weighing hopper. From the mixer it is discharged into a small bin over the Bates packer that sacks it for shipment. Trucks handle the sacks directly into the railroad cars or to trucks at the doorway. Shipments can be made by barge to any city on Puget Sound or by ocean steamer if desired.

Across the track is located the sack receiving room, where they are sorted

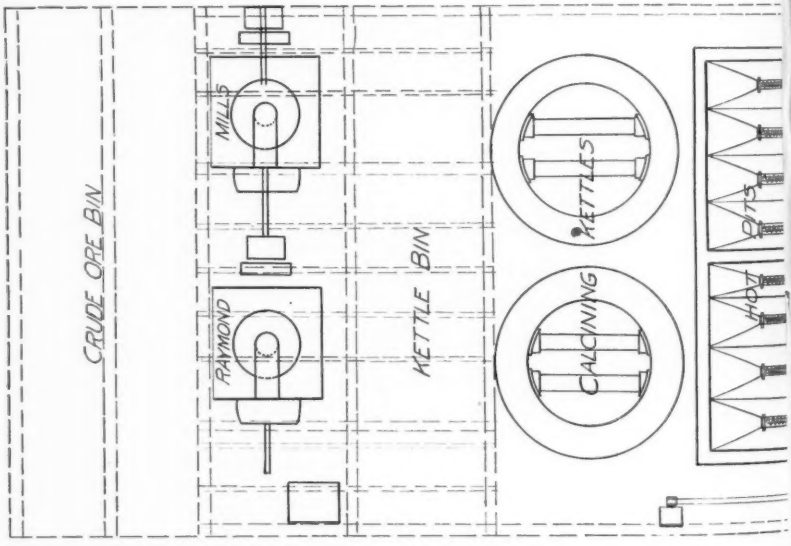


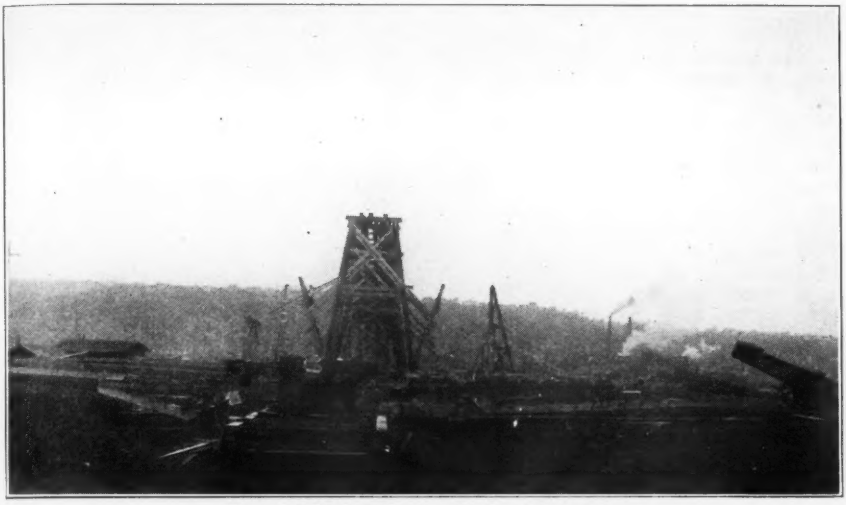


The Buildings Shown Here Have Since Been Completed

and patched. The land plaster bin and packing equipment mentioned above is in this same building.

General Electric electrical equipment is used throughout for operation of the machinery. Link-Belt troughing idlers and gear reducers are in use. The elevators, screw conveyors,

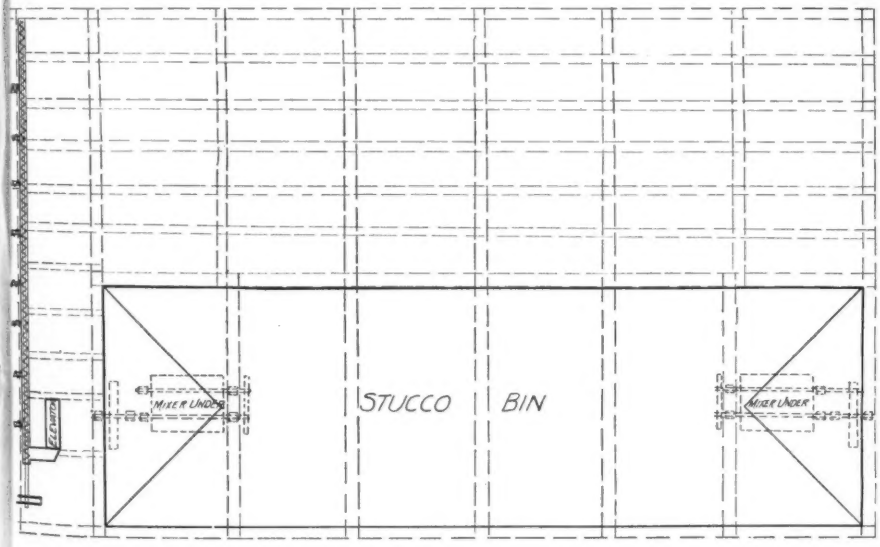




Tunnel Which Will Run Under Stock Pile

crusher, and calcining kettles were furnished by the Ehrsam Manufacturing Company of Enterprise, Kansas.

Mr. C. O. Bunker will have charge of the operation of this plant. Mr. Bunker was formerly in charge of the Tacoma plant of the Pacific Coast Gypsum Company, which was taken over by the Standard Gypsum Com-



PLAN

40 TRACK

PLASTER MILL
STANDARD GYPSUM CO. SEATTLE. WN.
TRACED FROM PLANS PREPARED BY
H. WINNER, ARCH. & ENGR. SAN FRANCISCO CAL.

pany and scrapped when this new plant was started.

The Seattle plant will produce 5000 tons of material per month, which will be marketed throughout the North Pacific Coast states. Mr. W. S. Keith, who has offices in the Leary Building in Seattle, is the Northwest manager for the company. Mr. Martin Uldall of San Francisco is secretary of the company. The plant was laid out by Mr. W. C. Ridell, who is in charge of the Long Beach plant of this same company. H. H. Winner, Architects and Engineers of San Francisco, prepared the plans for the buildings and docks. Mr. Guy F. Mason was construction engineer, while Mr. J. C. Hassel installed the machinery.

New Incorporations

Adamant Portland Cement Corporation; capital, $4,000,000. Incorporators: T. T. Baliss, Mason City, Ia., C. J. Lambert, H. S. Boyes, Signorney, Ia.

California Stucco Products Co., of Philadelphia; capital, $100,000. (Corporation Service Co.)

Pulverized Minerals Co., Dover, Dell. minerals; capital, $200,000. Incorporatir: E. E. Craig, Dover. Del.

Louisiana Portland Cement Co.. Wilmington, Del.; capital, $10,000.000.

Southern States Micaa Co., Dover, Del.; copital, $1,200,000. Incorporators: C. M. Cooley, S. N. Goodman. Atlanta, Ga., F. Shefner, Chamblee, Ga.

National Gypsum Co., Dover, Del.; gypsum, lime, etc.; copital, $10,000,-000. (U. S. Corporation Co.)

Southern Concrete Products Corporation, Miami, Fla.; capital, $40,000; limit of indebtedness, $500,000. Incorporators: C. W. Hayes, C. Ford, A. Logerstrom.

Crescent Tile Co., Trenton, N. J.; capital, $100,000. Incorporators: S. H. O'Donnell, C. H. Darling, A. Reikosky, Trenton, N. J.

Whitecliffs Corporation, New York, N. Y.; cement; capital, $3,000.000. (U. S. Corporation Co.)

Ridge Road Grael and Development Co., Erie, Paa.; capital, $100,000. Leonard Pasquaalicchio, incorporator.

William Brothers Company, metals of all kinds; capital, $10,000. Martin E. Smith, Wilmington, Del.. incorporator.

South River Sand Co., Elizabeth, N. J.; sand, clay, etc.; capital, $100,000.

North American Cement Corporration, Wilmington, Del.; capital, $50,-000. Incorporators: Arthur W. Britton, George V. Rilly, Robert K. Thistle, New York City.

Arkansas Cement Corporation, Wilmington, Del.; capital, $6,000,000. Incorporators: Robert K. Thistle, Michael A. Castaldi, George V. Reilly, New York City.

Iron City Sand and Gravel Co., Cumberland, Md.; sand, gravel, cement, building supplies, etc.; capital, $50,000. Incorporators: James C. Shriver and Eugene J. Kean.

Riverside Sand and Gravel Corporation, Roanoke, Va.; capital. $5,000 to $50,000. Incorporators: W. C. Clark, Norfolk, Vaa., E. L. Lash, Jr., Portsmouth, Va., W. L. Bentley, Jr., Norfolk, Va.

Heney Sand & Gravel Co., Seattle, Wash.; capital, $100,000. C. P. Bisselt, Jr., J. E. Peterson and Robert B. Porterfield, incorporators.

Standard Sand and Gravel Co., Wilmington, Del.; capital, $250,000. S. L. Mackey, incorporator.

Keystone Foundations, Inc.; cement blocks, bricks, etc.; capital. $50,000. J. L. Becker, Brooklyn, I. Rosenberg. Bronx, M. Greenberg, Manhattan, incorporators.

The Ideal Sand and Gravel Company, Mt. Healthy, Ohio; capital, $10,-000. Charles Scull, Edward Hine, Raymond Hine, Clinton Yerkes and Anthony Mund, incorporators.

Interstate Products Co., Chicago, Ill.; capital, $10,000; gypsum products and by-products, etc. Incorporators: Harold F. Smith, W. B. Smith, M. Odger.

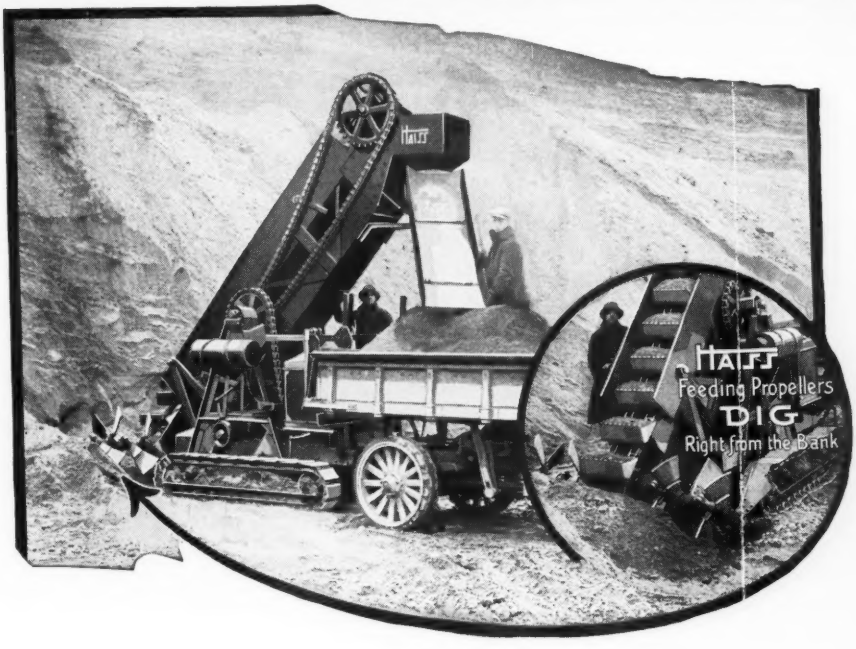
Aurora Gravel Company, Aurora, Ind.; gravel, stone, sand, etc. Cecil C. Shields, Herbert N. Christy, Clarence B. Wilson, E. L. Wilson, Alice G. Wilson, incorporators.

Duchess County Lime and Mfg. Co., Inc.; minerals; capital, $2,500,00. Michael A. Castaldi, Robert K. Thistle, Raymond J. Gorman, New York City, incorporators.

Olympic Portland Cement Co., Ltd., Seattle, Wash.; capital, $41,-263.91.

Fun Stone and Gravel Co., Shelby, Wis.; capital, $70,000. Edward A. Funk and E. C. Hinds, incorporatorrs.

Steinberg & Son Stone Co., Inc., Brooklyn, N. Y; limestone and building material; capital, $30,000. Samuel and Israel Steinberg, Jennie Mackta, incorporators.



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It is self-crowding — with a slow speed drive that keeps it pushing into the bank so that every bucket digs a full load.

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Gypsum—Quarrying Manufacture and Use

By George O. Gray

PART II

This is the second and last part of a paper by Mr. Gray, which was presented before the Seattle Mining Club of Seattle, Washington, on July 22, 1925. Mr. Gray is assistant sales manager of the Three Forks Portland Cement Company. In the first part Mr. Gray discussed the origin, occurrence, classification, quarrying and mining, and manufacturing of gypsum. In this part of the article the uses of gypsum are discussed.

Editor.

GYPSUM calcined at high temperatures was used as mortar by the ancients and was the common mortar used in Europe at points where it was easily found during the Middle Ages. The same material is still used extensively for mortar in Europe. It is also used for exterior stucco and for flooring in Germany, which market is on the increase. To date no American plants are making this "hydraulic plaster," as it is generally known.

Wall plaster represents the bulk of gypsum manufacture. Stucco is used for temporary construction, mixed with sawdust or shavings, sometimes called "staff," which was used on many World's Fair buildings. Stucco is used by wallboard companies for the manufacture of wallboard. This is unretarded and unfibred at the mill, but is retarded by the wallboard manufacturer, according to the "set" desired, which is based on the maximum strength of the paper backing between which is placed a mixture of gypsom plaster and sawdust at a thickness of one-fourth to three-eighths of an inch. When the paper has reached its maximum stretch, the plaster must start crystallizing as the crystals penetrate the fibres of the paper backing, becoming a part of the paper, so that no glue or binder is necessary, otherwise what is known as "peelers" would result. Wallboard and plaster board are coming into more general use each day. It is an excellent backing for plaster, in which a perfect bond is assured, besides its sound-proof and fire prevention value.

Gypsum block is another product that has many advantages in partitions, as the blocks can be sawed, also reused in remodeling. It has fireproofing value unequalled by any other commodity. In the East, gypsum is being used, not only being poured between floors, but for roof insulation as a prevention against heat and cold, all of which has been worked out by values. The American Can Company Building of Seattle is the first building in the Northwest to use gypsum for roof insulation. This type of roof is poured into place either by using forms, or with plaster board placed on purlins with reinforcing rods placed throughout the mass. Upon this roof any roofing material can be nailed.

There are a number of patents to recent date covering various types of wall construction by pouring between forms. One of these makes a very porous mass, by using a chemical that causes gas spaces, making the plaster expand three or four times its original bulk, forming enclosed air cells, somewhat like a sponge. It is recommended for insulation and fire-stop between studs and joists for fire protection and sound deadener.

Soundproofing of walls is not due so much to the kind of cementing materials used as to the thickness of the plaster and the voids. It is within reason to proportion sands so that a maximum of voids can be attained to absorb the sound waves, so as to reduce the sound transmitted through the wall, as in apartment houses, hotels, and dwellings. For churches and theaters it is important that very little sound be reflected, but it makes little difference how much is transmitted and a denser wall can be designed.

Plaster is of value as a fire-resistive material only so long as it stays in place. Standard fire, water, and strength tests made by the Underwriters' Laboratories, Inc., and the fire testing station of Columbia University have demonstrated beyond a question of doubt that for equal thickness gypsum will resist high temperatures for greater periods of time than any other commonly used fire resistive material. The destruction of gypsum from fire is due entirely to a slow calcination process which takes place during the period when the

chemically combined water of crystallization is being liberated by heat. The tests referred to have shown that at a temperature of 2200 degrees Fahrenheit it will take four hours to calcine the material to a depth of 3 1-3 inches. Also at the end of this period of four hours the temperature of the gypsum, three inches back, was only 350 degrees Fahrenheit and six inches back was but 208 degrees Fahrenheit, or less than the temperature of boiling water.

The calcination of gypsum is a uniform and slow process and is not attended by undue expansion, warping, buckling and similar contributory causes of destruction. This is due to the fact that while calcination is taking place, the water of hydration is being liberated in the form of steam, and for this reason the gypsum mass that is exposed to fire cannot attain a temperature that is appreciably higher than that of boiling water.

The proper care of plaster in sacks is very essential, as it is hygroscopic by nature and will readily absorb moisture from the atmosphere. As plaster absorbs the moisture, it affects its sand carrying properties and works harder under the trowel, which the plasterer calls "short." This shortness is due to the fact that moisture causes the colloids to stick together into a more or less homogeneous mass, so that when mixed into a mortar, less plaster surfaces are exposed to water attack, which reduces its ability to spread over the sand areas. However, if the plaster is not too "short working" to be applied, it will make a harder wall. The plasterers object very strenuously to short plaster, as it pulls on the shoulder and lowers the yardage per man per day, on account of lack of plasticity.

The manufacture of gypsum plasters is becoming standardized by being made to comply with Bureau of Standard specifications, as well as those of the American Society of Testing Materials. Each factory maintains a chemical laboratory so that continuous tests are made of the rock, setting time of each kettle after calcination, setting time after retarder is added, with and without sand, so that a complete record is on file. On all important work it is within the power of each builder to have tests made by commercial laboratories, certifying as to the quality of the plaster by taking samples from the shipments.

There are many important factors entering into the successful use of gypsum hardwall plasters that I touch on briefly. Water, when fit for human beings, is generally good for plaster mixing. Water used in excess has the tendency of dissolving the plaster colloids, making a watery mass instead of a "fat" plaster. When the proper amount of water is used, it attacks the colloids, forming a gelatinous emulsion on its surface, which is held in place by surface tension, thereby forming an envelope surrounding the particle, so that when external force is applied it will yield easily. The enveloping liquid acts as a lubricant, which is more or less viscous, depending on its concentration. When external suction is applied, it will be found very difficult to reduce the water below a certain amount. Surface tension is a very powerful force, so that it is extremely difficult to withdraw enough water to break the envelopes. The putty, therefore, yields readily to applied force and holds its water strongly against applied suction. These two properties are combined in the meaning of the word plasticity. Of the two, the second is the more important. It is well illustrated by the application of the finish coat to a hardened and partially dry brown coat. The brown coat is continually trying to suck the water out of the plaster to which it is being applied. If it is successful, the plaster may be torn but can no longer be spread, which the plasterer calls "boney."

Proper backing should consist only of the best materials used strictly according to specifications. Plaster board and metal lath have many advantages over wood lath and are well worth the additional cost.

Curing is very essential to secure a hard wall. During the spring, summer, and fall no plaster will make a perfect wall unless all openings are covered, preferably with black building paper, to protect the plaster from being robbed of the necessary amount of water for complete crystallization. Government records during this period show, in Seattle, a relative humidity as low as 11 in the month of April. During the damp, foggy days the plaster should have a circulation of air, as the plaster must dry out after it is set or it will soften. This is called a "sweat out," and sometimes the plasterers claim "that the plaster comes back." At times it is neces-

sary to use a slow drying heat to dry out the walls.

Cracks are not the fault of plaster. Lath cracks are caused by the wood lath not being wetted down before the application of the plaster. Wall and corner cracks are due to faulty construction. Small area checks are from undersanding and drying out.

Price per yard secures high grade walls if good mechanics are hired at a fair figure. The "eggshell" jobs that are being put on today are a crime, and the fault is not with the mechanics but with the builder who insists on paying 50 cents per yard. No wall should be less than ⅝ inch, better ¾ inch or ⅞ inch. A three coat job insures a better wall than a two coat. If an even, true wall is desired, the wall must have proper "grounds" and be "rodded."

Sand is a subject in itself, and, on account of its importance, I shall discuss it at some length. The American Society of Testing Materials issued a Tentative Specification on Plastering Sand in 1921, as follows:

(a) Sand used for plastering purposes in which gypsum plaster is employed shall be free from salt, and alkaline, organic, or other deleterious substances.

(b) It shall be graded from fine to coarse, and when dry not more than 10 per cent by weight shall be retained on a number 8 sieve; not less than 80 per cent by weight shall be retained on a number 50 sieve; and not more than 6 per cent by weight shall pass a No. 100 sieve. These sieves shall meet the specifications given in the Bureau of Standards Screen Scale.

Using this screen analysis as a basis for experiments, a number of sands, used for wall plastering purposes in the city of Seattle, were tested out by myself under the supervision of the Northwest Testing Laboratories, Seattle, by using different mixes, proportioned by weight of dry material, measured water, and average curing conditions, also noting the effect on setting time.

Two sands were found that came near the A. S. T. M. standard, while several varied, especially on the medium sizes. In order to study the relationship of each sand, the sand was screened through the following sizes: 4-8-14-28-50-100 mesh. Then, according to their granulometric composition, by classifying all the sand passing a number 4 and retained on a number 50 as coarse, that which passed through the number 50 and retained on a number 100 as medium, and that which passed through the number 100 as fine. This was then plotted out on a triangle chart according to Feret's method. In doing this it was easier to visualize the relationship of each sand to one another, by comparing the coarse, medium, and fine.

We know by actual experiments that fine sands accelerate the setting time in proportion to their relationship to the coarse. Therefore, when one plasterer uses fine sands and another coarse, the setting time might vary as much as one hour. It has been the practice to specify the using of a clean, coarse sand with a mix of one part plaster to two, two and one-half, or three parts sand, by weight, according to the purpose, or to specify by bulk, without taking into consideration screen analysis, or the bulking of sands containing moisture.

The measure of sand as used by the plasterers is a number 2, square pointed shovel. For a 1 to 3 mix, using fifteen shovelfuls of sand. This measure is fairly accurate on coarse grades, provided the sand is damp: but when it becomes dry, the amount of sand per shovel is reduced, as when sand is perfectly dry, not to exceed eleven pounds of sand can be retained on a shovel, or the mix would be about 1 to 1.65 using fifteen shovelfuls. Finer sands show greater bulking effects and less weight per shovel when damp.

The strike box, likewise, has its variations on account of moisture effects, for a cubic foot of coarse dry sand will weigh about 105 pounds, while a cubic foot of sand containing 3 per cent moisture will weigh only about 75 pounds. From the result of tests made on moisture effects on the bulking of sands, I am of the impression that the shovelful measure is the more accurate, provided the "tender" steps up the number of shovelfuls when using drier sands than normal.

The fineness modulus formula, now recommended for concrete mixes to ascertain the value of sand and gravel, varies with the size and gradation of the particles, does not give much importance to the fine particles, but does to the larger. While, on the other hand, the surface modulus theory, which is a number of roughly

proportional to the surface area of the particles of an aggregate, is large for small materials and smaller for coarser ones.

It is my opinion that all proportioning of plaster to sand should be based on screen sizes: 4-8-14-28-50-100 mesh, using the surface modulus formula for its calculation. Then all plastering sands could be classified into possibly three grades to be used under three different proportions to the plaster according to its surface areas; that is, with sands that contain a maximum amount of coarse, with a minimum amount of fines, in proportion to the mediums, giving a plastic mortar, the mix would be possibly one of plaster to three of sand by weight, while with a sand giving a maximum amount of fines to a minimum amount of coarse, with medium amount of fines to a minimum amount of coarse, with mediums in proportion, a mix of one to two would be the limit of sanding. With these two extremes ascertained, a third grade would be worked out, as an average between the two.

To support the surface modulus theory permit me to use as an illustration a cube that measures four inches on each edge, the surface area of each face being 16 square inches, or a total of 96 square inches on all six surfaces. By dividing this cube into eight smaller cubes their edges will measure two inches, with four square inches to each surface and a total of 24 square inches surface area on each of the small cubes, or a grand total of surface area of all eight of the cubes of 192 square inches, which is an increase double the original cube in surface area.

By further subdivision, the areas will continue to increase under the same ratio, so that in grinding the cube into smaller particles so all will just pass through a number 20 mesh screen, we will have 1,813,670 separate pieces, having a combined surface area of 11,707 square inches. Through a number 100 mesh we will have 328,-016,728 separate pieces with a combined surface area of 66,207 square inches. By assuming that a cubic foot of rock from which the sand was made is 162 pounds in weight, it is found that with one pound of this rock, ground so as to pass through a number 20 mesh sieve and retained on a number 22, the surface areas total 1,951 square inches; while those ground to just pass a number 100 will measure 11,035 square inches, or an increase of about six times in the combined surface areas of the 100 mesh over the 20 mesh.

Since the mission of plaster, or any other cementing material, is to bind the sand particles together by complete covering of the surface areas, it is not difficult to conceive from the illustration why a harder wall is made from coarse sands than from fine, and why fine sands will not be bound together as there is not sufficient material to spread around the increased surface areas.

Coarse sands are not always available. Often the mechanic is forced to use a fine sand against his own wishes, yet he will put the same amount of sand to the plaster, not knowing that he should decrease the quantity. His method is to judge the amount of sand to use by the "looks of the mortar," and by the way it feels under the trowel. Again, it is possible to put more yardage per man with a fine sand than coarse, for the trowel slips more easily.

Research work on plaster mixes has accomplished much in the past few years, but a great field is open for further experiments on plastering sands, the importance of which we have just begun to realize fully. It is impossible within the space limits of this paper to cover the subject in detail as to the quarrying, manufacturing, and uses, and might I add the abuses of gypsum hardwall plaster.

Nature has given the world a non-metallic rock whose products are simple in their manufacture for the purpose of making the home beautiful with its protection against heat and cold, fire-proof and sound-proof. Yet man will abuse, some with intent and some not knowing what they do. The problem is ours to correct by bringing the facts to those who care to know the truth.

W. J. Brown has been made Southern sales manager of the Lehigh Portland Cement Co. He succeeds Frank Traynor, who resigned to become general manager of I. E. Schilling & Co., Miami. Mr. Brown made his entry into the cement industry in 1907 as chemist for the United Kansas Portland Cement Co. and was afterwards associated with the Dixie Portland, the Edison Portland. the National Cement and the Georgia Cement and Stone companies.

Manufacturing High Grade Chemical Lime From a Black Fossiliferous Limestone

By F. A. Westbrook

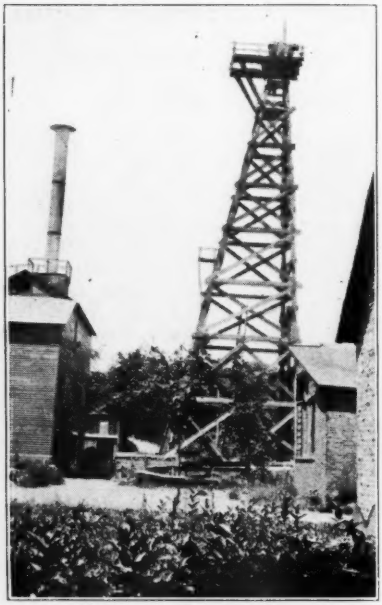
LIME has been shipped out of Glens Falls, New York, for over ninety years. Glens Falls was established in 1763 by Abraham Wing, "the founder" so-called. After helping to survey the town plot at the "Halfway Brook" in 1762, he went there at the head of the Society of Friends the following year, taking up large grants in the immediate vicinity. Originally the settlement was called Wing's Falls. Its name was changed in 1788 to Glenn's Falls in honor of Colonel Johannes Glenn, and finally became Glens Falls.

Its first prominent industry was the production of lumber, which was followed, about 1833, by the establishing of an industry with a product which has since become well known commercially as "Jointa Lime." The first lime sent out of Glens Falls was burned in 1832 in the kilns of Keyes P. Cool, the grandfather of the present Mayor, Honorable Charles W. Cool. The lime industry was later carried on under the name of Cool and Clark until just before the civil war, when Halsey R. Wing and John Keenan formed a partnership under the name of Jointa Lime Company. They continued to manufacture Jointa lime for a number of years. Later their interest was purchased by the McDonald Brothers and Goodman, and some time after the McDonalds sold out to Charles Fowler. The partnership of Goodman and Fowler continued until the year 1900, when the concern was incorporated under the name of Jointa Lime Company, Inc. In 1902 the F. W. Wait Lime Company was incorporated and took over from the Jointa Lime Company, Inc., all of its high grade black fossiliferous limestone, from which raw material is manufactured the superior quality of high grade chemical lime known as "Jointa Lime," for which during three-quarters of a century Glens Falls has been noted.

This lime is extensively used by wire mills, chemical works, bleach plants, acid works, ledger and writing paper mills and many other high grade chemical plants requiring a chemical lime free from magnesium, silica, iron oxide and alumina. An average analysis of Jointa Lime is as follows:

Calcium Oxide	98.38	per cent
Magnesium	0.50	" "
Silica	0.75	" "
Iron Oxide	0.37	" "
Alumina	0.37	" "
	100.00	" "

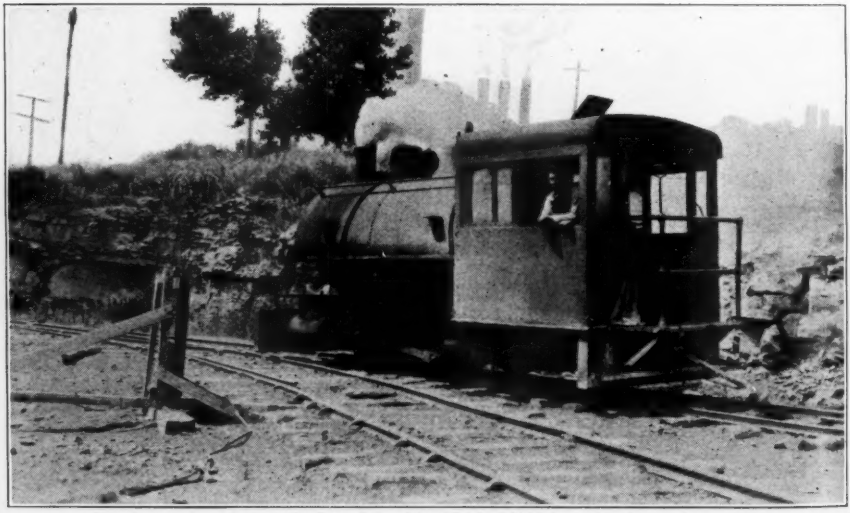
Boxes Loaded With Stone on Small Flat Cars Which Have Come from the Quarry



Wooden Tower 107 Feet High for Cableway

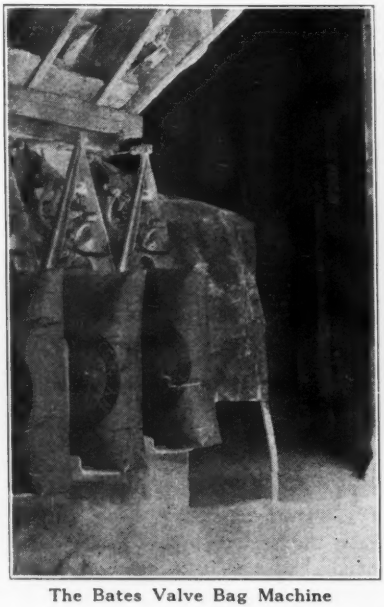
Kilns Which Are Fired from Second Floor

The stone is a high calcium black marble and occurs near the surface in shallow beds. As a result there is no hoisting problem, so far as the quarry is concerned. As shown in the illustrations, the narrow gauge tracks leading direct to the kilns enter the bed of the quarry. These tracks are, of course, moved so as to lead directly up to the point where stone is being quarried in order that cars may be loaded with the least possible effort. The cars are hauled back and forth to the kilns by a small steam locomotive.



Steam Locomotive Engine for Hauling Cars

Broken Stone Stored Along Tracks



The Bates Valve Bag Machine

The kilns are loaded from above, but instead of using an inclined railway, which would take up a good deal of space and cost a good deal to construct, an aerial cableway with a Lidgerwood hoisting engine has been used.

Stone is loaded at the quarry directly into boxes, in so far as practicable, suitable for hoisting on the cableway. There is one of these boxes on each small flat car. The tracks are arranged so that they may be pushed under the cableway and the boxes

Narrow Gauge Tracks Lead from Quarry to Kiln

lifted off. During the charging of the kilns the locomotive shifts the train so as to bring one loaded car after another under the hoisting apparatus. It will be seen that this is a very economical way of charging, as it reduces handling to a minimum and requires no more power for hoisting in this manner than with inclined tracks, in fact probably less because it is not necessary to pull up the cars themselves, which are heavy compared to the boxes.

Blasting has to be done rather cautiously because the quarry is within city limits. It is, therefore, done a little at a time with small charges of 40 per cent dynamite, and as a result of this all of the drilling is done with Denver jack-hammers. Pieces which are too large for burning are broken and loaded into the boxes by hand. The kiln is about one-half mile from the quarry.

The burning equipment consists of 5 Keystone kilns. These are fired from the second floor of the building, which houses them, and they have a cooling cone below into which the burned lime is dropped. They are so arranged that wheelbarrows can be pushed under them and loaded by gravity, or the lime may simply be allowed to fall to the concrete floor, where it is spread out. The layout is shown in the illustrations.

On one side of this building is a standard gauge railroad siding so that when bulk shipments are to be made, usually to the steel mills, the lime may be wheeled directly into box cars. On the other side of the railroad track is the storage house, into which empty barrels may easily be unloaded from the freight cars or filled barrels loaded onto them when shipments in that form are to be made. At the end of these tracks beyond both buildings is a large pit for the storage of coal, which may be dumped from the cars.

A good deal of hydrated lime is furnished to the paper manufacturing industry. The hydrating machinery, which is a Kritzer hydrator, is located at one end of the row of kilns. The bulk lime as it comes from the kilns must, of course, be crushed before it can be hydrated. The Sturtevant lime crusher is located below the floor on which the lime is drawn from the kilns, so that it is a simple matter to wheel the bulk lime a short distance to a trap door in the floor and drop it into the crusher. The crushed material is carried by a conveyor to a storage tank at the top of the building. It is then allowed to drop, as desired, into a pit, where it is picked up by an elevator and carried to the top of a Kritzer hydrator. It next passes down through the six cylinders of the hydrator and is taken by a screw conveyor to the Raymond separator, which whips it out to the desired fineness

Narrow Gauge Tracks Leading to Quarry at Right and to Mill at Left

(200 or 300 mesh) by suction. The finished, hydrated lime then drops into the bin above the Bates bag machine.

The bagging machine is located on the side of the building adjacent to the tracks. It is thus very easy to load the bags directly onto the freight cars as they are filled, or, if they are for stock, a plank is laid over the tracks across the space between the manufacturing building and the store house and the bags carried to the latter on hand trucks. Of course all of the machinery is electrically operated.

The output of this plant is from 60 to 75 tons of lime per day. It is not the largest lime plant by any means, but it is about the largest high grade chemical lime plant in the country and the only one in the United States using a black marble. It is a striking fact that this black stone becomes, after burning, lime of the purest white.

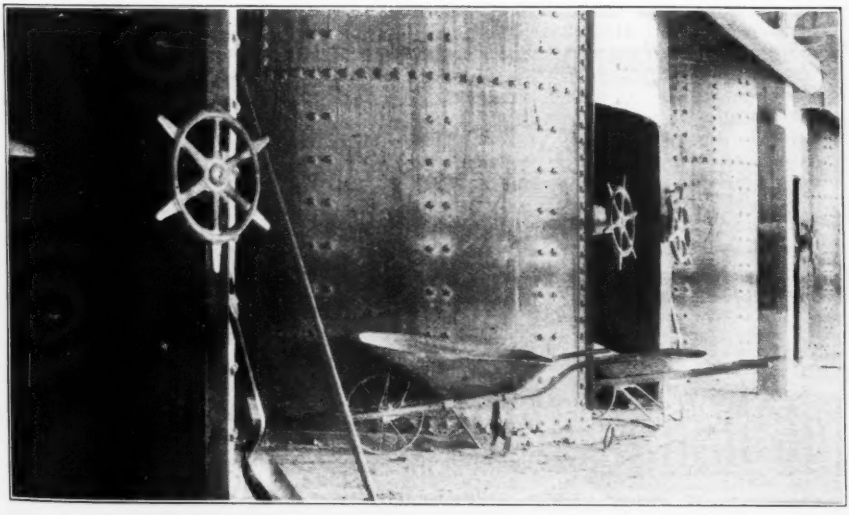
The highest grade Westmoreland gas coal is used in the proportion of about 1 to 3. As the finished product is distinctly a quality product it commands a corresponding price. Nevertheless, as will be realized from the foregoing description of the plant, all practicable means have been taken to place its production on a highly efficient basis. Mr. H. T. Russel, the president and general manager of the company, has been in the business for thirty years or more and is too keen a business man not to realize that inefficiency, no matter what the conditions under which any commercial enterprise is carried on, is sure to result fatally sooner or later.

A very practical precaution which Mr. Russel has taken to guard against interferences with production has been to accumulate large quantities of stone in suitable sizes for the kilns along both sides of the narrow gauge tracks leading to the quarry. This is desirable because it is sometimes impossible to work the quarries on account of spring freshets and other causes which cannot be controlled.

Uehling Appoints

The Uehling Instrument Co., Paterson, N. J., have recently appointed two new southern agents to handle their line of CO_2 recorders and other power plant instruments, namely John C. Candler, 315 Glenn Bldg., Atlanta, Georgia, to cover, Georgia, Eastern Tennessee and the southern half of South Carolina, and Charles M. Setzer of Charlotte, N. C. to cover North Carolina and the northern half of South Carolina.

Mr. Zimmer entered the employ of The Linde Company nine years ago as Junior Salesman, and has steadily risen in rank. Most of the time he has represented the company in the Central West, coming to New York early in 1924 to act as Assistant General Sales Manager.



Rows of Kilns on Ground Floor Where Access Is Had to Cooling Cones

Distribution of Cement

The following figures show shipments from Portland cement mills distributed among the States to which cement was shipped during May and June, 1924 and 1925.

Portland cement shipped from mills into States, in May and June, 1924 and 1925, in barrels. *a*

Shipped to	Year 1924	January 1925	February 1925	March 1925	April 1925	May 1925	June 1925	July 1924	July 1925
Alabama	1,871,885	85,410	103,513	177,510	191,541	185,314	214,195	212,720	256,741
Alaska	6,304	132	0	294	709	0	1,284	1,432	2,816
Arizona	389,935	34,370	25,945	27,009	31,264	32,749	32,451	30,474	37,842
Arkansas	1,099,304	41,376	44,352	72,198	94,695	87,340	92,101	129,334	78,059
California	10,772,733	988,883	753,123	1,029,118	1,027,744	1,081,945	1,066,088	942,273	1,061,048
Colorado	1,334,493	42,425	69,871	102,537	131,363	125,744	120,818	161,005	118,272
Connecticut	1,576,021	34,810	50,026	113,668	160,616	177,292	172,564	192,957	176,644
Delaware	384,228	5,786	9,444	21,766	41,573	28,892	37,330	46,078	43,326
District of Columbia	718,146	37,285	65,176	58,474	70,765	103,996	81,334	79,851	82,133
Florida	2,155,836	265,463	227,811	272,094	261,180	313,846	348,330	173,184	341,849
Georgia	1,406,476	93,062	98,569	140,634	112,250	127,545	129,748	107,824	132,050
Hawaii	40,587	417	0	1,500	2,250	5,608	6,108	5,451	993
Idaho	262,142	2,598	11,029	17,667	28,393	28,613	28,122	23,922	28,498
Illinois	13,309,655	463,388	378,947	846,638	1,467,815	1,790,601	1,636,329	1,533,330	1,853,734
Indiana	5,492,150	139,782	143,464	255,597	433,996	569,436	617,360	744,692	658,042
Iowa	3,138,347	53,044	52,039	161,164	284,477	346,484	310,558	401,855	327,155
Kansas	2,128,898	33,588	120,405	212,402	232,220	242,880	233,522	199,437	226,787
Kentucky	1,727,038	52,013	68,970	115,222	174,795	195,351	231,491	188,068	229,652
Louisiana	1,255,952	75,992	97,638	98,193	108,250	99,402	100,016	109,385	99,111
Maine	386,092	4,837	5,238	21,702	36,163	38,435	43,541	50,045	41,475
Maryland	1,983,993	47,635	98,231	143,291	207,844	231,935	249,105	218,371	247,835
Massachusetts	3,352,294	113,101	134,591	257,381	344,406	374,243	350,620	388,173	386,058
Michigan	9,335,798	190,905	248,240	437,712	859,815	1,140,027	1,264,462	1,205,309	1,229,598
Minnesota	3,238,161	59,395	97,034	173,618	321,854	425,473	409,235	405,863	436,453
Mississippi	507,201	29,867	28,564	35,778	48,174	47,573	66,012	41,506	67,446
Missouri	3,929,248	115,141	162,992	379,157	489,316	652,330	583,561	427,101	683,097
Montana	202,541	5,334	6,093	16,450	23,030	28,170	28,904	20,985	31,486
Nebraska	1,496,892	31,832	46,281	99,780	180,951	198,338	181,516	158,955	203,863
Nevada	90,949	2,492	5,177	7,254	10,767	11,676	10,784	8,806	10,068
New Hampshire	377,917	9,419	15,911	27,592	39,906	36,814	40,837	41,240	41,843
New Jersey	6,345,124	157,612	243,534	498,227	722,751	721,605	737,572	738,895	760,944
New Mexico	236,644	7,911	10,320	18,865	19,699	17,141	18,406	22,007	16,323
New York	17,282,302	400,896	587,674	1,159,830	1,717,441	2,028,808	2,090,644	2,041,145	2,170,960
North Carolina	2,846,808	79,817	128,770	200,097	277,616	289,056	324,201	259,730	343,683
North Dakota	270,354	1,380	3,742	16,589	38,937	47,789	66,089	72,154	55,305
Ohio	9,201,578	259,628	271,075	592,069	894,683	1,054,230	1,099,767	1,211,851	1,099,016
Oklahoma	2,201,699	58,872	155,083	203,161	201,886	235,096	225,879	177,823	225,729
Oregon	1,205,672	54,117	60,816	103,813	101,661	129,048	134,038	140,656	143,672
Pennsylvania	12,950,829	288,916	421,519	808,636	1,250,501	1,482,560	1,869,299	1,580,596	1,869,377
Porto Rico	6,686	0	0	0	0	0	0	0	0
Rhode Island	612,344	15,668	17,908	54,083	79,063	72,914	89,213	60,649	75,383
South Carolina	571,372	46,840	73,313	72,929	65,806	74,198	85,087	42,238	75,376
South Dakota	472,154	4,331	14,528	40,697	57,039	66,445	59,120	70,244	55,487
Tennessee	1,590,992	69,669	87,499	116,856	133,037	163,812	185,536	148,173	208,562
Texas	3,844,187	260,540	345,057	381,320	401,517	373,605	411,795	388,590	418,401
Utah	429,630	3,794	16,821	28,567	33,469	41,447	37,733	55,413	38,975
Vermont	337,146	3,129	3,060	10,312	25,353	24,178	26,978	35,469	26,245
Virginia	1,685,953	54,445	95,942	132,891	160,139	154,167	172,760	156,644	180,025
Washington	1,831,348	85,969	90,669	151,814	180,845	265,735	328,589	179,521	334,466
West Virginia	1,663,250	45,912	56,629	85,703	134,357	140,992	161,484	226,563	164,874
Wisconsin	4,357,044	113,396	73,320	142,620	358,379	507,654	569,687	586,677	562,363
Wyoming	328,221	3,492	9,181	16,358	19,981	32,466	31,290	47,769	25,691
Unspecified	684,598	15,964	26,430	46,236	34,875	8,023	3,996	66,488	48,647
	144,927,151	5,092,090	5,961,563	10,205,073	14,327,067	16,659,016	17,417,489	16,558,921	18,033,478
Foreign countries	819,849	69,910	53,437	73,927	66,933	75,984	83,511	55,079	97,522
Total shipped from cement plants	145,747,000	5,162,000	6,015,000	10,279,000	14,394,000	16,735,000	17,501,000	16,614,000	18,131,000

a Includes estimated distribution of shipments from three plants for May and June, 1924; and from four plants for May and June, 1925.

Stone That You Can Mould

By Chester N. Reitze

Part II

This is the second and last part of an interesting treatment of cement manufacture. This subject was presented by Mr. Reitze before the Seattle Mining Club on August 5, 1925, at Seattle, Washington. Mr. Reitze is assistant general manager of the Portland Cement Association at Seattle. In the first part of this article, which appeared in the September 15th number of Pit and Quarry, Mr. Reitze discussed briefly the development of the cement industry and the raw material requirements.—Editor.

PORTLAND cement, as mentioned in the last article, is the properly proportioned mixture of certain substances. To secure sufficient mixing, it is necessary that these materials be ground to a powder finer than flour. But the mere mixing of the various ingredients is not sufficient to produce a material that will answer the requirements of a good cement. The elements must combine chemically. Hence the manufacture of portland cement can conveniently be divided into three distinct stages: first, the raw materials must be properly proportioned and intimately mixed; second, this mixture must be heated to a high temperature to provide the chemical combination; and last, this resulting clinker must be ground to impalpability, the portland cement of commerce. The three stages have become more or less standardized and vary only in the mechanical details in the various plants. In the first, however, there are two distinct roads of approach, called the wet and the dry processes.

Coming from the quarry the limestone is deposited in a giant crusher. This crusher reduces the rock to a size such that the largest piece will pass a ring six inches in diameter. The yawning mouth of this great machine seems to swallow the rock and return it through hidden channels to the earth from which it came. Yet the riddle is easy to solve. Down underneath this bulk of iron comes a steady stream of different appearing material. It is the stone which a short while ago was a part of that mountain in the quarry. Again it is swallowed from view and once more it returns in still smaller sizes, two inches, perhaps, in diameter. And from here it goes to great storage piles, to convert the spasmodic supply of the quarry into the constant stream of materials demanded by the plant.

As the materials leave the storage piles in the wet process plant, sufficient water is added so that the grinding and pulverizing are done while the materials are in a fluid state. The thick, creamy substance resulting is known as slurry. Mechanical agitators are necessary in the huge slurry tanks to prevent settling and to maintain uniformity in the mixture.

Conversely, in the dry process the latent moisture of the materials must be removed if they are to be pulverized efficiently. Mechanical conveyors carry the materials into large rotating steel cylinders where hot gases drive out the moisture. Thoroughly dried, the two substances are next to be proportioned. Previous tests have determined the necessary amounts of each material, and automatic machines carefully weigh out the predetermined quantities.

Properly proportioned, the substance is now ready for grinding. Like most industries as complex as cement making, many and varied devices have been introduced for the mechanical details. But as a typical example there is the hammer mill where the constant stream of rock is reduced to particles the size of sand.

Particles the size of sand are not sufficiently small to secure the association that is necessary previous to the chemical combination and so the sand is carried to another machine for pulverizing. This time the tube mills may be used. These mills are large steel cylinders. They are partially filled with small steel balls—in one mill there may be as many as 30 to 40 tons, an average freight car load,—and in the continuous rotation they form a cataract of steel which reduces the clinker to a powder so fine the eye cannot detect the separate particles. That mountain has shrunk to impalpability.

Such machinery, however, is essentially a later day application. When the industry was first introduced into

this country, makeshift devices were all that the manufacturer had. It was impractical to reduce the raw materials or the finished product to the fineness which the industry now demands. Old millstones, resembling in appearance the maize grinders of early colonial days, were the only means of grinding. In the pulverizing machines of the modern plant there is produced a powder so fine that about 85 per cent will pass through a sieve which will hold water, a sieve, finer than silk dress goods, with 40,000 openings to a square inch.

Now the materials are ready for the second stage of manufacture, that of chemical and physical combination. Automatically conveyed to the upper end of a huge rotary kiln, they start on a two or three hour journey through a temperature hotter by 200 degrees Fahrenheit than that required to melt steel.

In the early nineties practically all of the country's output was made in the vertical type of kiln, a crude affair, burning coke and turning out perhaps as much as a hundred barrels of clinker a day. In the modern mill these antiquated kilns have been replaced by giant, brick-lined steel cylinders burning powdered coal, fuel oil or natural gas. Some of the more recent installations are as long as five freight cars; in operation they weigh as much as ten steel Pullmans; and they produce perhaps 2,000 barrels of white-hot chinker every twenty-four hours. In doing this a ton of powdered coal or equivalent oil or gas would be consumed every twelve to fifteen minutes.

It is in the rotary kiln that the raw materials are converted into a new substance. Under the heat of 2,500 to 3,000 degrees Fahrenheit, the tiny particles of the previously unrelated substances are combined into a new material, a material of new physical and chemical properties known to the manufacturer as clinker, but actually nothing more than portland cement before the final grinding.

These kilns are set at a slight inclination, and by the slow, constant rotation the material cascades down the ever lifting sides as it slowly flows throughout the length of the great cylinder. Electric motors, operating through a series of reduction gears, are necessary to rotate the kilns. It is to ensure the free working of such massive movable structures that the industry last year consumed some 41,000,000 pounds of lubricants.

To protect the steel shell from the excessive heat, it is lined with nine-inch fire brick. But even this fire brick is so eroded in a few months that it must be replaced. Last year 5,800,000 bricks were used in relining cement kilns.

At the lower end, beneath the pipe that carries the powdered coal (coal blown like gas through a pipe line), there emerges a continual stream of clinker still white-hot. In order to reduce its temperature for handling, it is passed through a rotary cooler, resembling in miniature the rotary kiln from which it just came. The clinker is then conveyed to storage. This new substance is impervious to the elements, and hence provides the manufacturer an opportunity to accumulate a reserve in times of little demand.

The final stage in the manufacture of portland cement is the grinding of the clinker into the fine powder familiar to the consumer. This is accomplished in much the same way that the raw materials were ground and pulverized previous to the chemical combination. The glass-hard clinker is reduced to the consistency of sand in various types of mills. For instance, there is the centrifugal mill. In these centrifugal grinders the material is crushed by rollers pressed by centrifugal force against an iron ring.

Before the clinker enters the tube mills for final pulverizing, a small amount of gypsum, not to exceed 3 per cent, is added. This gypsum serves to retard the rate of setting when the cement is used in concrete so that it will not harden too rapidly. The cement industry added to the prosperity of the gypsum business by consuming some 775,000 tons last year.

The finished product is now ready to be stored in huge bins until it is bagged for shipment. Automatic machines have been perfected to replace the old scoop and shovel methods of the early days. With one of these machines an operator can fill about 500 sacks an hour. The machine is so adjusted that exactly 94 pounds, a cubic foot, of cement goes into every bag. After the empty sack is tied on an automatic machine, it is filled through a valve in the bottom. Last year some 56,000 miles of wire were

used to tie the sacks in which the output of cement was shipped.

Enough cement was produced during the past year to fill some 600,000,000 bags. To provide sufficient containers the cement companies must maintain some 240,000,000 bags in service. Of the $450,000,000 estimated investment in the cement business, $45,000,000 is invested in cloth sacks alone. It has been estimated that one in eight of the bags used for shipment fails to return to the manufacturer in spite of the refund that is offered. To replace that number, some 65,000,000 last year, a strip of cloth 30 inches wide would have to be 36,000 miles long, enough to keep 3,400 looms busy every day for a year and to require 65,000 bales of cotton. No small part of the modern plant is devoted to maintaining a ready supply of serviceable bags by sorting, cleaning and repairing those that are returned. Nineteen million pounds of paper were required in 1924 to make the 50,000,000 non-returnable bags used in the cement industry.

There are few manufactured materials which cause such wear and tear on machinery as does the making of cement. Depreciation is rapid. Grinding and pulverizing such large quantities of hard rock and harder clinker erode the wearing surfaces. Complete blacksmith and repair shops are vital to the efficient maintenance of every plant. As much as a tenth of the total plant valuation may be invested in spare parts in order to reduce costly shutdowns to a minimum. One out of every five men working in a cement plant is a member of the repair force. Last year the industry had to replace 2,000,000 lineal feet of belting.

Throughout the process of manufacture, close watch is kept of the physical and chemical properties of the cement. Every plant maintains well equipped laboratories. As the cement is borne to the storage bins after the final grinding, samples are collected, which are subjected to eleven different physical and chemical tests. That particular batch of cement must meet the standard rigid requirements, and so it is with the 28,000,000 tons produced annually.

The distribution of this vast amount of material is an important item to the railroads, which transport about 85 per cent of the output. With the incoming coal, equipment and material, which is sufficient to represent nearly 3 per cent of the entire freight tonnage of all the railroads in the United States, there are some 8,000 items on the list of commodities carried. The motor truck also comes in for its share of the haulage, and with the increase in the concrete road mileage this means of transportation is constantly growing in favor.

In all of these operations in the manufacture of portland cement from the quarry to the finished product, great quantities of power are required. As a whole the industry is rated as the tenth largest consumer of power in the United States. A generating station capable of furnishing the lights and power for a community of 150,000 inhabitants is necessary for one of the largest plants. Practically every one of the many and varied machines in the modern plant is individually operated by electric motors. Batteries of huge motors working through magnetic clutches turn the finishing mills.

It is easy to imagine the great quantities of fuel which are necessary to supply the excessive temperatures in the rotary kilns. Yet this represents but about two-thirds of the entire fuel demands. Of the 137 operating plants included in a recent report of the United States Geological Survey, 118 used pulverized coal either alone or in combination with oil or gas, while 18 used fuel oil alone, and one used natural gas. This coal as purchased from the mine must be pulverized as fine as the finished product, and here again we meet that oft mentioned sieve. The cement manufacturer is rated as the fourth largest manufacturing customer of the bituminous trade. Last year on his coal bill there were itemized some 11,000,000 tons. To maintain uninterrupted production the cement manufacturer keeps a careful eye on his supply of coal. Strikes, railroad delays, a dozen different reasons prompt him to keep well provided in advance.

There is also the manufacturer who uses oil in his kilns. He must be as sure of an uninterrupted fuel supply as the coal consumer. Although fewer than 20 plants use fuel oil exclusively in the kilns, last year some 5,000,000 barrels were consumed, an average per plant of several tank car loads every working day.

To promote the correct utilization of their product, the majority of the cement manufacturers in this country

and Canada, as well as several in Mexico and South America, jointly support the Portland Cement Association. This organization in connection with Lewis Institute, Chicago, maintains extensive laboratories for the investigation and improvement of the various details connected with cement and concrete. To bring concrete to the highest possible perfection huge testing machines have been installed. Thousands of tests are made annually on different kinds of concrete in which different aggregates, various amounts of water, and various quantities of cement have been used. The effort is to give the smallest user as well as the largest contractor the latest and most reliable information that will improve the quality of his work.

We have seen in a general way the details in manufacturing portland cement. We have heard astounding figures of the quantities produced. We have stretched our imaginations to visualize a few of the uses of this product, but there are many more.

Freight Car Loadings

Loading of revenue freight for the week ended September 12 totaled 975,434 cars, according to reports filed by the carriers with the car service division of the American Railway Association.

Owing to the observance of Labor Day, it was a decrease of 127,512 cars under the week before with decreases, compared with the preceding week, in the loading of all commodities. Compared with the corresponding week last year, the total for the week of September 12 was a decrease of 86,347 cars and a decrease of 85,129 cars under the corresponding week in 1923.

Miscellaneous freight loading totaled 376,151 cars, a decrease of 48,909 cars under the week before and 17,544 cars under the same week last year.

Loading of merchandise and less than carload freight amounted to 38,035 cars, a decrease of 30,957 cars under the week before and 16,270 cars under the same week last year.

Coal loadings totaled 157,357 cars, a decrease of 0,861 cars under the week before and 25,443 cars under the same week last year.

Grain and grain products loading amounted to 44,690 cars, 11,041 cars below the week before and 21,539 cars under the same week last year.

Live stock loading for the week amounted to 28,687 cars, a decrease of 3,525 cars below the week before and 10,107 cars below the corresponding week last year as well as 10,373 cars under the same week two years ago.

Forest products loading totaled 64,764 cars, 6,895 cars below the week before and 5,069 cars below last year as well as 10,222 cars below the same week two years ago.

Ore loading totaled 54,771 cars, a decrease of 4,994 cars below the preceding week, but 6,941 cars above last year. It was, however, a decrease of 21,884 cars under the same period two years ago.

A comparison by weeks follows:

	1925	1924	1923
Sept. 12	975,434	1,061,781	1,060,563
Sept. 5	1,102,946	.....	.....
Aug. 29	1,124,436	1,020,809	1,092,150
Aug. 22	1,080,107	982,700	1,069,915
Aug. 15	1,064,793	1,019,077	1,062,993
Aug. 8	1,051,611	941,407	978,750
Aug. 1	1,043,063	945,613	1,033,466
July 25	1,029,603	926,309	1,041,415
July 18	1,010,970	990,230	1,001,350
July 11	982,809	909,973	1,019,800
July 4	864,452	757,904	850,082
June 27	901,341	908,251	1,021,471
June 20	982,600	803,546	1,005,432
June 13	987,106	902,592	1,008,838
June 6	994,874	910,793	1,012,312
May 30	920,514	986,209	820,551
May 23	986,209	918,214	1,015,532
May 16	984,916	913,201	992,319
May 9	981,370	908,213	984,078
May 2	981,711	913,550	961,617
April 25	959,225	878,387	962,578
April 18	922,778	876,916	970,042
April 11	917,284	880,937	945,271
April 4	922,375	961,990	896,375
March 28	931,395	907,389	896,735
March 21	909,363	908,290	916,818
March 14	924,149	916,762	904,116
March 7	930,009	929,381	905,344
Feb. 28	862,910	944,544	916,624
Feb. 21	925,295	945,679	830,187
Feb. 14	902,877	935,589	816,646
Feb. 7	928,244	906,017	849,352
Jan. 31	896,055	929,623	865,314
Jan. 24	924,254	894,481	896,464
Jan. 17	932,150	894,851	864,297
Jan. 10	932,807	872,023	873,908
Jan. 3	765,727	706,292	727,246

Stope Method In Quarry Reduces Costs For Oregon Portland Cement Company

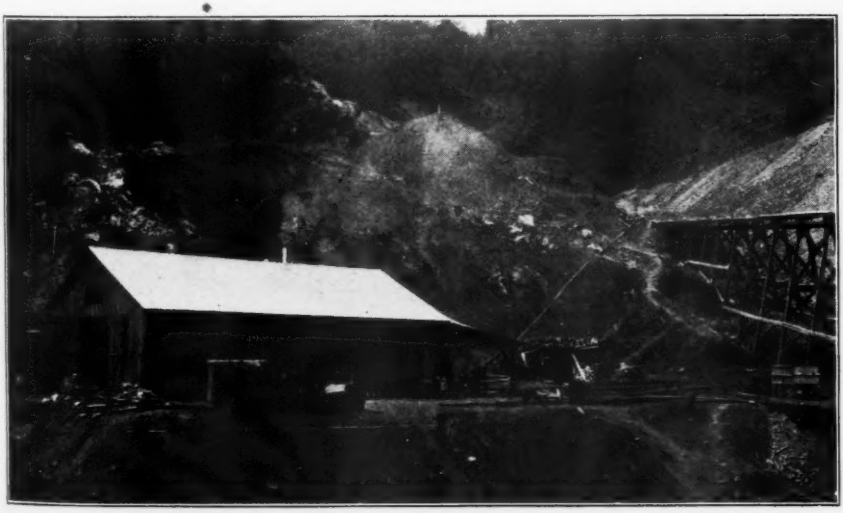
By E. D. Roberts

FOLLOWING out the policy of reducing the cost of operation whereever possible, the Oregon Portland Cement Company has started to operate its lime rock quarry by the stope or glory hole method which is effecting a saving of nearly 50 per cent in the cost of quarrying lime rock. The Oregon Portland Cement Company, whose plant is at Oswego, Oregon, secures its rock from two sources namely, high lime rock from the Roseburg quarry, and cement rock from the Dallas quarry, and mixes it in the proper proportions to secure the desired slurry.

Heretofore, the Roseburg quarry was operated under the contract system although the Company owned the quarry and plant. It was deemed advisable to take over the operation of the quarry themselves and to make certain changes to reduce the cost of the lime rock. Accordingly, a contract was let to Grant Smith and Company to drive a tunnel to tap the ledge 100 feet below the present floor of the quarry with an inclined shaft from the quarry floor to intercept the tunnel at a point 530 feet from the opening. Work was started in March of this year, and the tunnel completed, together with 200 feet of additional development tunnel, a machine shop, new bins and a trestle for the filling of it by gravity, by July first. Mr. F. S. Baillie, General Manager for Grant Smith and Company, supervised the construction work, and Mr. Axel Carlson was Superintendent for the contractors, while Mr. A. R. Moore, who planned the new installation, looked after the interests of the Cement Company during the construction period.

Previously, the rock was mined in an open pit by blasting and hand loading into 1½ yard cars which were handled to the dumping place where a 4 yard car underneath received the rock. A gravity plane carried it to the loading bunkers where it was end dumped into them and drawn off into a train of 3 cars, each one under a gate, by means of a hand ratchet gate. From this point on the operation will continue for a time without change and will be described later in the article.

Blasting the rock from the sides of the hole by 5 to 10 foot breast drills causes the rock to fall to the pile



Machine Shop—Tunnel Opening In Center—Trestle for Old Tram at Right

Train of Cars Over Loading Bins

below. If too large to handle, the size is reduced by bulldozing. A vertical sliding hand operated ratchet gate controls the flow of the rock into the mine cars on the track below. These cars are of steel construction and dump from the side, after being hauled to the rock bins by a 4 ton Jeffrey electric locomotive obtaining its electricity from a storage battery which it carries.

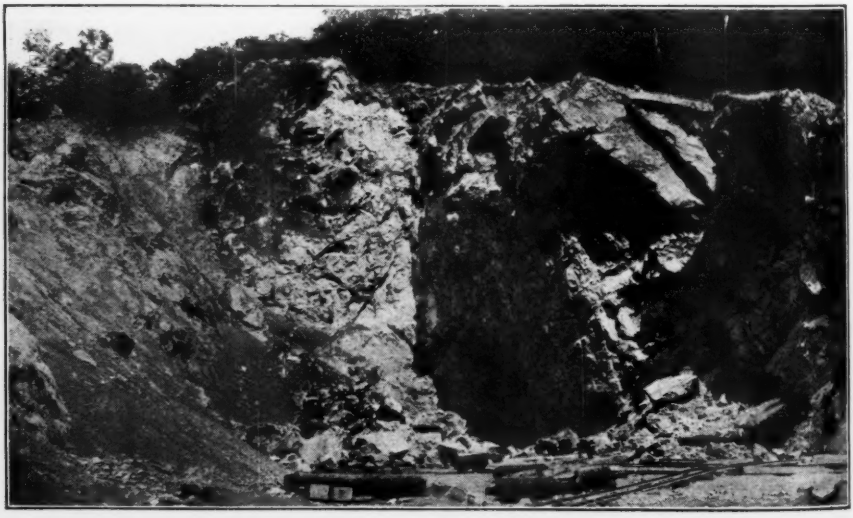
Two storage batteries have been provided so that one can be charging while the other is in use, thus providing for continuous operation of the locomotive. Electricity for charging is furnished by a 65 ampere, 120 volt Westinghouse generator driven by a Fairbanks Morse gasoline engine. Electricity for lighting the mine and camp is also furnished by this layout. A steel I beam over the charging room furnishes the track for an overhead rolling Yale and Towne Triplex block which lifts off a battery from the car and replaces it with the other.

The Roseburg Quarry

In the Roseburg quarry two Ingersoll Rand 9x8 compressors furnish compressed air for operation of the drills and the air to operate a Worthington piston pump to de-water the tunnel. This water is led into 2 large tanks for use around the plant. The water thus obtained is slightly more than enough to meet requirements. The compressors are driven independently by 25 H.P. Fairbanks Morse Diesel engines. As only one is required at a time, the other is a standby.

A Garden City fan was used for ventilating the tunnel during the time of construction. This fan will be kept for use in case operating conditions require it. Power for its operation is furnished by a 3 H.P. Fairbanks Morse gasoline engine.

The new bins are of wood construc-



The Present Roseburg Quarry

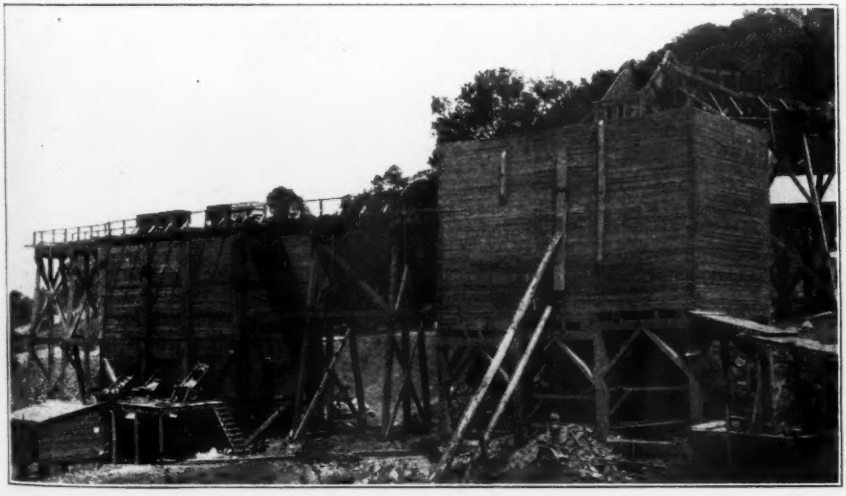
tion with a capacity of 900 tons in the three bins. Steel has been used for lining the hoppered bottoms. The new bins are constructed alongside the track leading to the old bins with three ratchet gates for drawing the rock off into the cars. The Link-Belt Company manufactured the gates.

Two trains of 3 yard Western side dump cars transport the rock to and dump it into the lower bin from which it is drawn off into standard gauge railroad cars. These side dump cars are fastened to a cable so that the loads pull back the empties. Not enough difference in height between the loading point and the tipple is secured to operate the train wholly by gravity. Consequently a Mundy steam driven hoist provides the power to pull the cars the last 200 feet to the point over the bins where they are dumped. A 25 H.P. Erie boiler furnishes the steam to operate the hoist as well as to operate a Fairbanks Morse piston steam pump pumping water into an overhead tank for use in the standard gauge dinkey. This dinkey handles the empty railroad cars from Carns on the Southern Pacific Railroad, 5 miles up a branch standard gauge railroad owned and operated by the Cement Company. After spotting for loading, it handles the loads back to the main line for hauling to Oswego by the Southern Pacific Railroad, a distance of nearly 200 miles. The boiler also furnishes steam for operating a Knowles steam pump

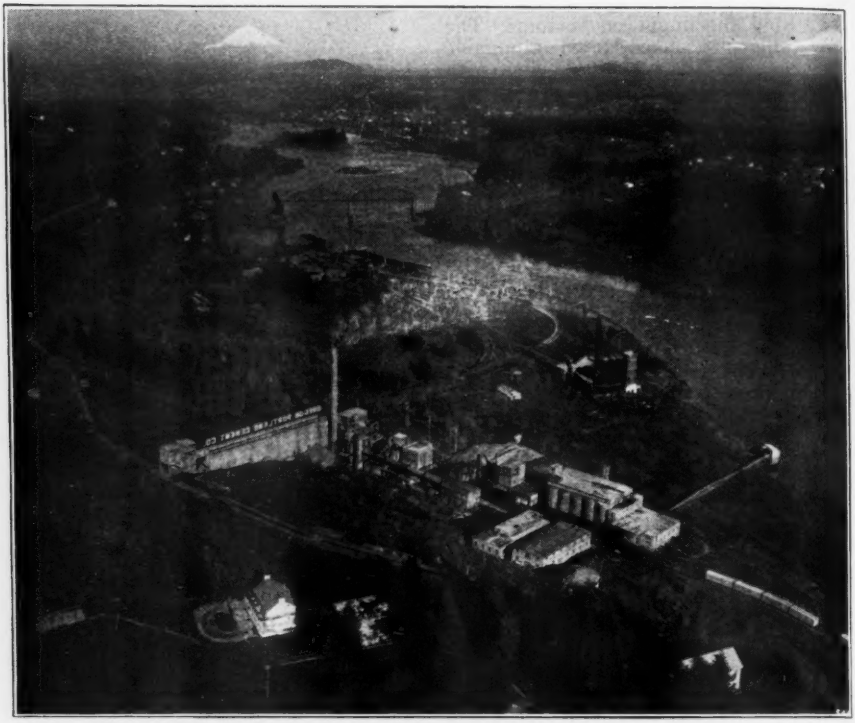
End View of Loading Bunkers

which pumps fuel oil from tank cars into storage tanks and from storage tanks to the storage tank of the engine. The work is so arranged that the loading crew operates the tram half a day and the railroad the other half.

Future developments are planned which will further reduce the cost of operation. One is to drive a new tunnel on a level which will allow the mine cars to dump directly into the lower storage bin, eliminating the up-



The New Bunkers at Left and the Old Bunkers at Right in the Roseburg Quarry



Airplane View of Oregon Portland Cement Company's Plant. Note Employees' Club House, Tennis Courts and Baseball Diamond in the Foreground

View of New Dallas Quarry—Stone Is Hand Picked and Loaded Into Dump Cars

per bins and operation of the inclined tramway.

The old bins and tracks will be kept in place for the present to serve as a standby in case of trouble in the tunnel which might stop the output of rock for a time.

The quarry will be operated under the supervision of Mr. A. R. Moore and Mr. Axel Carlson.

The Dallas Quarry

About five miles southwest of Dallas, Oregon, on a spur line from the Salem Falls City Line of the Southern Pacific Railroad, the Oregon Portland Cement Company has opened a new quarry from which it is now securing the cement rock used in the manufacture of portland cement at its Oswego cement mill. They have been securing this cement rock from a quarry near the present one, but due to the increasing depth of overburden, it was abandoned in favor of this new deposit.

The deposit lies in a triangular formation with the apex of the triangle at the point where the side hill has been opened up to mine it properly. The present face is about 50 feet wide and will soon widen to 400 feet with a depth of about 40 feet.

The rock is loaded by hand into 3 yard Western wheeled scraper side dump cars. The deposit is shot with mud seams which have to be sorted out in order that the percentage of lime be maintained as high as possible. High lime rock is shipped from Roseburg, a distance of 200 miles, making the transportation charge very high on this part; so it is important that the Dallas rock be well sorted.

A Fordson, equipped with driving wheels for a 36 inch gauge track, hauls the quarry cars to the loading bins. The track has been constructed on a one and seven tenths grade with a one and five tenths grade over the bins. The cars are dumped directly into the bins. Gates in the bottom of the bins allow the rock to fall directly into standard gauge railroad cars for shipment over the Southern Pacific Railroad Company's tracks to Oswego, Oregon.

Ingersoll Rand compressors and drills are used in operating the quarry. The power is supplied by Diesel engines. The deposit was overlaid with a 4 to 8 feet of clay and earth which was removed by a 2 inch hydraulic giant. Recent prospecting on the property of the company at Dallas has shown a ledge of lime rock running 77 per cent calcium carbonate. This will be prospected and if feasible will be developed and quarried to replace some of the Roseburg rock, thereby reducing the cost of manufacture considerably.

Mr. J. B. Bywater has recently been placed in charge of the operation of the Dallas quarry. The new quarry shows that great attention has been given to secure a steady flow of material at the least possible cost. Development work to secure several years' supply of rock ahead is being carried on continuously.

The New Dallas Quarry Showing Drill Marks on the Face

Earthquakes and Insurance

By Dwight Ingram

"EARTHQUAKE insurance? What in the world will they be trying to sell us next?"

As recently as last year property owners were known to make such an exclamation when an aggressive salesman tried to interest them in the idea of earthquake insurance. The question is not so common now, however. Instead, the same property owners, not only along the Pacific Coast and in the Rockies, but even in New York and New England, are going unsolicited to their insurance agents and buying policies without having to be "sold."

For some unknown reason North America seems to have come into a period of "abnormal seismic activity," as the scientists call it. Or, as the common citizen would say, we have had twenty-five earthquakes in North America during the first half of 1925, covering the entire continent from Alaska to Mexico and being felt in some degree from Maine to California. And while each quake means the adjustment of some long existing strain in the earth at the point where it occurs, with a consequent probability of immunity for that particular spot for a while, each quake also means that the earth strains have probably been passed on to some adjoining section of the country with a likelihood that such new strain will some time have to be relieved.

As a result of this great activity of the earth, quake insurance has now been permanently and prominently placed on the nation's program of sound underwriting. Such insurance has become almost universal in California. It is carried by property owners generally along the rest of the Pacific Coast and in the Rocky Mountain states. And it has actually come into wide use through the remainder of the United States. That it is not restricted to the far west will be surmised from taking note of the following large lines of earthquake insurance that are in force in the east and middle west. The office building at 60 Broadway, New York, is insured for $3,000,000; the Schuster Stores of Milwaukee are insured for $5,630,000; and the group of buildings making up the plant of a New England electric lighting corporation are insured for a total of $20,000,000. While the significant growth of quake insurance should really be judged by the large mass of policies being written daily on ordinary factories and homes, these giant accounts make rather spectacular incidents in the history of underwriting. Outside of the acknowledged earthquake sections of the country, most of the insurance has been written in New England and New York, where the tremors of last February indicated that we never can tell where a quake may strike, but since no place is guaranteed to be immune from disaster, a considerable amount of insurance is also being placed in the middle west and south.

Unlike the catastrophes of fire and industrial accidents, we have no elaborate science of preventive engineering for earthquakes. Guarding machines in a factory will forestall cut fingers, and putting in wired glass windows will keep fire from spreading from one building to another, but we have no similar safety code to protect us against the earth's activity. We do know that the more substantially built a building is, the less is the liability of damage. Frame sheds will be demolished more easily than brick structures, and buildings of re-enforced concrete will withstand some very heavy strains. But, after all, no one can prevent an earthquake. The only real protection can come through insurance, and business men prefer to collect their indemnity in a straightforward commercial way on policies they have bought rather than to become recipients of charity or relief funds.

Earthquake insurance is cheap. It is probably being sold right now below cost, for insurance actuaries are beginning to comb over their loss records rather carefully, and the general belief in the profession is that rates will be raised before the end of this year. There is one further peculiarity of rates that will doubtless be changed soon. At present machinery and other contents take the same rate (or, in California, even a higher rate) than the building itself. Loss records, however, show that quakes do much more damage to buildings than to machinery therein, and the next readjustment will probably find buildings rating higher than their contents.

The cost of insurance along the Pa-

cific Coast and in the Rockies runs from six to ten times as much as in the rest of the United States. Outside of the Pacific Coast territory, all buildings are grouped for rating in four classes: Class A, private residences, barns and garages; class B, fireproof buildings (of steel, re-enforced concrete or other non-combustible material); class C, buildings of ordinary brick, tile or frame construction not over five stories high and not over 5,000 square feet in ground area; class D, all buildings not covered by the first three classes. The rates for both buildings and their contents are:

Class A—.04 per $100.
Class B—.04 per $100.
Class C—.05 per $100.
Class D—.06 per $100.

Coinsurance is generally used on earthquake policies. That is, a stipulation is put in that the property owner will carry insurance at least up to a stated percentage of the actual value of his plant, and if he should fail to do so will be called on to bear a proportionate part of any loss himself. In other words, if the usual policy contains an 80 per cent coinsurance stipulation, it means that the owner of a $10,000 building must carry insurance of at least $8,000 if he expects the insurance company to pay his losses in full. There is no coinsurance on private residences (Class A), but the rates quoted above for other buildings presuppose 50 per cent of coinsurance. If the property owner intends to carry insurance equal to more than half the value of his plant, and is willing to make such an agreement in his policy, the following credits, or deductions from the above basic rates, may be given:

For 60% coinsurance deduct 12.5%
For 70% coinsurance deduct 22.5%
For 80% coinsurance deduct 30%
For 90% coinsurance deduct 35%
For 100% coinsurance deduct 40%

Most policies are written for three years and paid for in advance, in which case the entire premium is 2½ times the one year rates given above.

The legal contract or policy form used for earthquake indemnity follows almost exactly the general provisions of the standard fire insurance policy. Since the basic fire policy is so widely known and understood by business men, it is doubtless necessary to discuss only the two principal points in which the fire and earthquake contracts differ. Fire policies ordinarily do not insure the foundations of buildings; these are practically not damageable by fire, and the producer does not want to pay a premium for something he could not collect on. With earthquake, however, the foundations are just as likely to be thrown out of line or otherwise damaged as any other part of the structure, and they are consequently included in the coverage. The second peculiarity of earthquake insurance is that it covers not only damage or destruction caused by the earth tremors, but also if fire ensues it covers such resulting fire damage. This is not covered by the regular fire insurance policy.

As with fire, wind and other catastrophes, earthquakes cause more loss than the direct destruction of property. If a plant is destroyed near the beginning of the operating season, the inevitable delay in rebuilding would mean that an entire year's profits would be destroyed. Such indirect loss, known as "business interruption" or "use and occupancy," is well known in fire insurance, and the principles are just the same for quake. In many cases it is more important for a producer to insure himself against loss of salaries, taxes and profits for a year due to earthquake demolition of his plant during the active season, than to cover the mere replacement value of his buildings. The rates charged for this indirect or business interruption loss for each $100 of overhead expense and profits insured (outside the Pacific Coast) are:

Class A, residences—.03
Class B, fireproof—.024
Class C, small buildings—.03
Class D, large buildings—.036

Earthquakes have many other effects on insurance than the creation of new policies. They very definitely affect the validity and status of some more common forms of insurance. For instance, both the standard fire and the standard windstorm policy say that in case any part of the insured building shall fall except as the direct result of, respectively, fire or wind, the policy is immediately void. The reason for this is that a building which has partially collapsed is usually weak and presents a much greater risk than was figured by the rate charged. For fear some reader may think that this is a foolish distinction and that the fire insurance companies would have to pay for the entire building if it was burned up following earthquake,

we must note that there are plenty of records to show that they do not pay so freely. After the San Francisco earthquake in 1906 it was one or two days in many cases before the fire reached certain sections of the city that had been damaged by the quake. In this interval photographers, newspaper and amateur, went over the ruins making pictures. Fire insurance companies bought up quantities of these photographs, and from them were able to prove to many policy holders that most of the damage was done by the earth tremors. In such cases they paid for the estimated actual fire damage but not for the entire loss. This experience set so definite a precedent that insurance companies now have no trouble enforcing a fairly literal interpretation of this provision of the policy. If the fire follows the earthquake immediately, the only way to cover it is by earthquake insurance. If it does not, then the property owner holding fire or windstorm policies should immediately get in touch with his insurance agent and have him order new insurance or reinstate the old. Such reinstatement is going on in Santa Barbara right now. The fire insurance companies are mailing out riders to be attached to all of their policies stating that the insurance is again in force, but that the amount of loss will be reduced by any damage which has been done by the earthquake.

Another form of earthquake risk for which insurance is provided is the automobile or motor truck. For a charge of $0.15 per $100 of value a rider can be attached to the fire and theft policy covering any automobile or truck, extending the insurance to cover damage done not only by earthquake but also by windstorm, hail, explosion and water damage. If earthquake insurance is worth carrying on a building, it is probably also advisable on motor cars.

Quakes will usually, of course, create some legal liability on the part of the property owner for damages to the persons or property of others. Any injuries to employees in line of duty are naturally taken care of by the workmen's compensation policy, regardless of how those injuries are caused. As for damages to the public, a property owner is probably not liable for such losses which happen right at the time of the tremors, because these are so obviously beyond his control. He should pay especial attention, however, to the possibility that his buildings or machinery have been weakened by the quake, because such weakening might leave them in condition where some part would fall or give way at a later date, in which case the property owner could undoubtedly be sued for damages.

An earthquake might conceivably help a producer in one way, for it might loosen or break up his material deposit so that the handling would be considerably simplified. In speaking of insurance, consequently, we recognize that indemnity is neither wanted nor possible on the deposit of material, and insurance policies will be limited to the buildings and machinery. Adjusting losses under earthquake policies is very difficult for both the insurance company and the property owner, however anxious they may be to work together and settle it up fast. The actual damage in many cases can not be fully appreciated for several days after the tremor occurred. For instance, if a supporting column is cracked, it is a nice engineering problem to determine whether it can be safely mended or whether it must be removed and replaced. And where, as often happens, the tremor causes a shift in the stresses of a building an apparently small amount of damage may be enough to require the tearing down and rebuilding of a large part of the structure in order to re-establish a safe equilibrium.

The destruction which earthquakes can cause is quite comparable to our greatest conflagrations. Overlooking such major catastrophes as San Francisco and Tokio, the tremors in Santa Barbara on June 29th of this year caused direct property damage conservatively estimated at $12,000,000. And the quake that covered large areas of Wyoming, Idaho, Montana and Washington two days before wrought destruction of over $500,000. This quake was actually more severe than that of Santa Barbara, but the damage done was less because its center fortunately was in a sparsely populated part of the country. It is estimated that the Santa Barbara quake caused an average of a 35 per cent loss to the insurance companies involved, but the damage in the Rocky Mountain tragedy fell almost entirely on the individual property owners, because until that time they had shared the feeling of most Americans that earthquakes could not happen east of the Pacific Coast.

How Peerless Portland Cement Company Reduced Material Handling Costs

By J. L. Langner, Chief Engineer, Stearns Conveyor Company

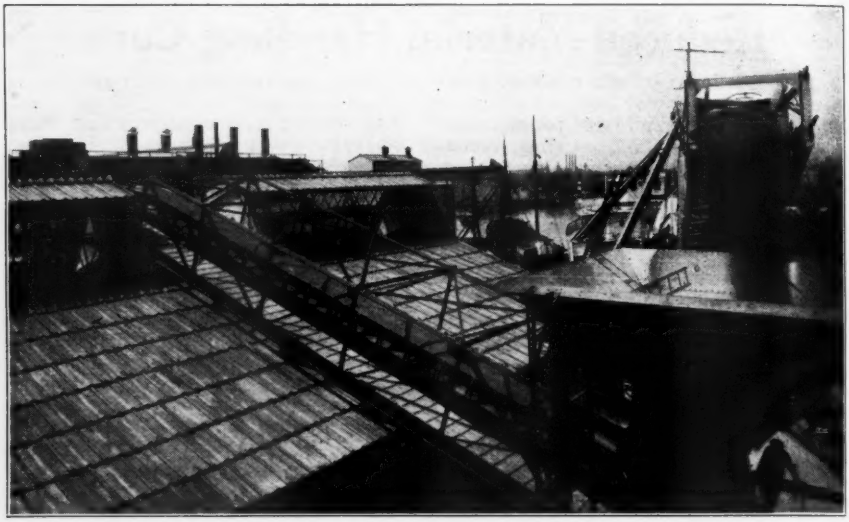
INCREASED building construction and road making during recent years have not only brought a greater production of cement, but have also intensified the need of cement mills for rapid and efficient handling of the bulk material. In many respects the average cement mill is faced with quite different problems from those encountered in ordinary manufacturing plants. The demand is largely seasonal; adequate reserve storage is difficult to obtain on account of the large quantities of materials needed; and the cost of handling must be kept down to the minimum in order to meet competition. The cost of handling, moreover, is a greater proportion of the total cost in the cement industry than it is in other lines of production.

In order to reduce the handling expense as far as possible, the Peerless Portland Cement Company of Detroit, Michigan, decided to install a conveyor system for handling its crushed stone and coal from the unloading to the storage points. In certain respects the problems presented were somewhat unusual. The quarries from which the raw materials are obtained are so situated with regard to the mill that raw material can be brought up by water. This means cheap transportation, but it also means that this route is open for only eight or nine months of the year. It is necessary to provide sufficient storage facilities to tide over the period when the water route is closed. For these reasons it is essential that the material handling equipment have as low an operating cost and as efficient working units as possible. In this way the storage piles will be drawn upon as little as possible during the open season, and large storage area will be provided.

The method used by the Peerless Portland Cement Company is worth studying. The company's freighters, which are fully equipped with conveyors, dock alongside the plant, and by means of the conveyor unloading boom with which each vessel is provided, they unload the raw material into a 20x20 foot square steel hopper mounted on a steel supporting frame 36 feet above ground level. The limestone, which is crushed to a size of 2½ inch mesh and under, is drawn out through the bottom of the hopper through a regulating chute which governs the flow of the material directly onto the belt of the conveyor. This belt conveyor consists of a 54-inch belt about 590 foot horizontal pulley centers. The actual length, however, is slightly more than this because from the bottom of the receiving hopper the belt has to be inclined upwards to an elevation of 38 feet above ground level in order to carry the conveyed material over the roof of the adjoining building. At a distance of 65 feet from the center of the receiving hopper the belt again runs horizantally and continues to do so for the remainder of the conveyor length.

The distribution of the crushed limestone to the storage pile is accomplished by means of an automatic belt tripper, with a double discharge spout and fly-gate. This automatic belt tripper is, to the best of our knowledge, the largest ever built by anyone. The total travel of the tripper is 490 feet, but this travel can be shortened to any desired extent, or the tripper can be clamped stationary at any desired point. The driving mechanism is simple and effective, and is driven from the conveyor belt through a series of chains and gears. The reversing gear operates with steel friction disc clutches. A 200 H.P. 870 R.P.M. motor driving through silent chain and spur gear to tandem pulleys furnishes the operating power for the conveying units. The installation is capable of handling as high as 2,500 tons per hour at a belt speed of 540 feet per minute.

An interesting angle to the investigation made as to the power required to operate the above equipment was the striking saving made possible in operating and maintenance cost through the use of Stearns standard ball-bearing troughing idler pulleys and return rollers as compared with plain bearing type generally used. This saving was especially noticeable



Material Being Discharged Into Hoppers for Distribution By Belt Conveyor

Detail View of the Ball Bearing Troughing Idler Pulleys

on the long conveyors used in this installation. In this instance it was found that there was a saving in the driving power required which amounted to 35 per cent. This, however, did not end the economy. It was further found that in view of the reduced horse-power to be transmitted, and the consequent lessened strain on the belt, it was perfectly satisfactory to use an 8-ply belt instead of the 12-ply belt which would have been necessary otherwise. The difference in belt cost was more than sufficient to pay for the slightly increased expense of the roller bearing carrier pulleys and return rollers. In order to take care of the belt-stretch, two belt take-ups are provided. One is a horizontal type gravity take-up having a five-foot travel. This is placed at the head end. The other, which is installed at the foot end of the conveyor, is of the screw type and has a three-foot travel.

Reclaiming the crushed limestone from the storage piles is done by means of two electric overhead cranes equipped with grab buckets. One crane is located on each side of the belt conveyor and has a runway 540 feet long running parallel to the conveyor belt.

The coal is handled in a somewhat different manner. There are two alternative methods whereby coal is received at the plant; by boat, and by rail. In locating the storage space it was decided that it should be adjacent to both the limestone storage and the water front. This location, however, while desirable from many considerations, was somewhat awkwardly situated with regard to the railroad tracks. These tracks are 410 feet distant and are on the far side of the limestone storage piles. Since it was obviously impossible to obstruct the operation of the reclaiming cranes and buckets by carrying the coal across the limestone storage piles, it was decided to put the conveyor underground. The following arrangement was adopted.

The coal is discharged from the railroad cars into a 12-foot square steel hopper. Thence it passes to a 30-inch apron feeder operating through a countershaft driven from the foot shaft of the 30-inch belt conveyor leading to the coal storage.

The Storage Pile Distribution System

The apron feeder is installed in a pit under the railroad track. From this point the coal is received upon the above mentioned belt conveyor, which is situated in a concrete tunnel about 375 feet long which passes under the limestone storage piles. Near the farther end of the tunnel the belt begins an incline to about 20 feet above ground level. At this point it discharges into a 15-foot square steel hopper.

Driving this conveyor, which is on 400 foot centers, is a set of tandem pulleys operated through countershafts by a 20 H.P. 720 R.P.M. motor. The conveyor belt speed is 250 feet per minute, and the handling capacity is 125 tons of "run-of-mine" coal per hour.

From the hopper the coal is discharged into a 24x32 inch single roll crusher, and thence it passes to a 24-inch belt conveyor of 50 feet centers. This conveyor runs at right angles to the 30-inch belt and at an incline of 20 degrees. It discharges direct to the coal storage pile.

All conveyor equipment, including the hoppers and the steel supports, was designed and made by the Stearns Conveyor Company of Cleveland, Ohio. In view of the substantial savings of power and maintenance expense already outlined, Stearns roller bearing idler pulleys and return rollers were used throughout.

The plant of the Peerless Portland Cement Company at Detroit has recently been completed and has cost altogether about $3,000,000. It will be seen from this partial description of its manufacturing and handling equipment that it is a thoroughly up-to-date and efficient plant.

P & H Foreign Bulletins

Harnischfeger Corporation of Milwaukee, Wisconsin, have recently issued bulletins covering their general line of excavating machinery, published in both Spanish and Portuguese.

In these bulletins is given the general description of the construction and operation of gasoline, Diesel or electric shovels, draglines, clamshells, cranes, trench hoes, skimmer scoops, pile drivers, cane loaders, wheel and ladder type trenchers, backfillers, and truck cranes, as well as clearance specifications for these machines.

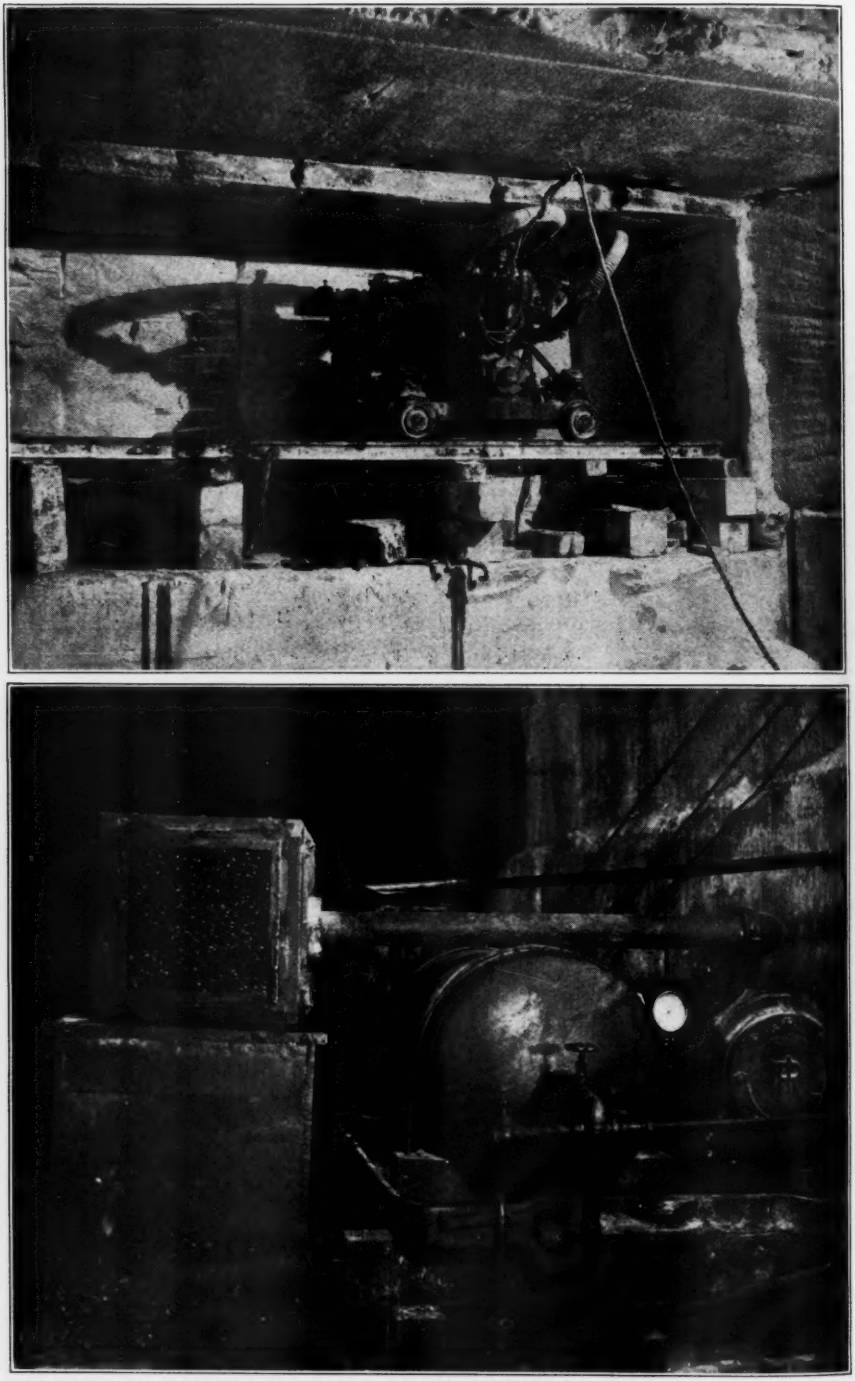
Deck of Freighter Showing Unloading Boom

An Interesting Quarry Operation

By George Ransom

ALTHOUGH the quarrying operations of the Vermont Marble Company have been freely discussed in print because of the up-to-date methods employed by the company, the very progressiveness of the company makes it desirable to keep in touch with what they are doing. The Riverside quarry located in the township of Proctor, Vermont, is interesting because a part of it is covered. Furthermore the openings are located near the Otter Creek which overflows its banks every

Block of Marble Being Pulled Horizontally By Means of the Top Derrick to the Opening



Top View Shows Electric Channelling Machine While Bottom View Shows Electrically Driven Compressor

spring. In order to save the quarry from being flooded the openings have been built up with marble blocks and concrete to something like 3½ to 4 feet above the surface.

The fact that operations are now being carried on in a tunnel 400 feet back from the opening, calls for special arrangements for getting out the blocks of stone. To accomplish this there are two derricks, one on the top of the quarry and another on the old floor 110 feet below the surface. The tunnel portion is considerably lower than the old floor of the open part of the quarry, and, of course, the blocks of marble are raised up to the latter level by means of a derrick. The hoisting is done from above. When the stone has been de-

Block of Marble Being Lifted From the Bottom of Tunnel By Derrick

posited on the old floor, it is loosened from the lower derrick and dragged along to a point under the opening by means of the upper derrick and sheave. It is then raised up through the opening by the upper derrick. As the quarry blocks of marble weigh from 15 to 20 tons apiece, the method of getting them out is a proposition requiring engineering skill of no mean order.

The equipment at present in this quarry is as follows:

4 Channelling machines with 12 H.P. slip ring motors to run the compressors.

2 Electric drills—5½ H.P.

4 Ingersoll-Rand air drills.

1 Ingersoll-Rand air compressor with 50 H.P. squirrel cage motor.

Small Gould pump with 2 H.P. squirrel cage motor.

Large Gould pump with 35 H.P. squirrel cage motor.

112 H.P. motor for hoisting.

5 H.P. motor for turning the derricks.

Pumping is done in two stages. A small Gould pump lifts the water from the tunnel into the "well,"—the lowest part of the abandoned portion of the quarry. A large pump raises the water from the well to the surface.

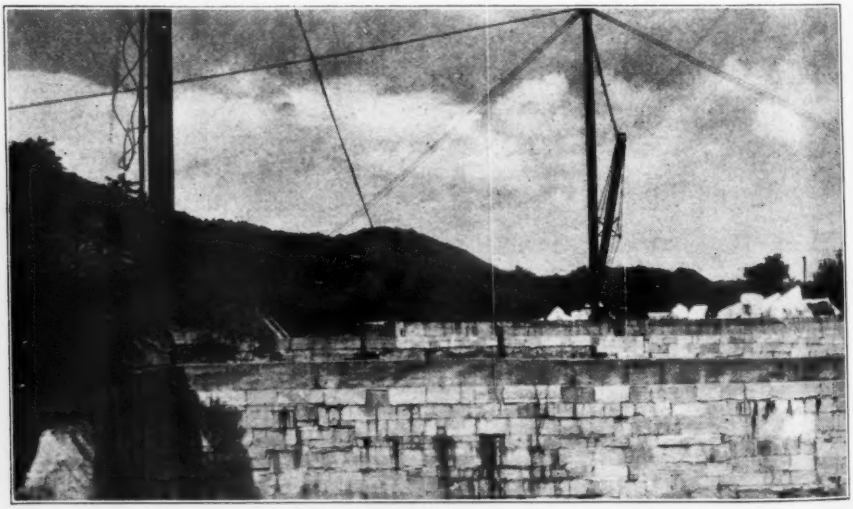
Mica in 1924

The total qauntity and value of domestic uncut mica sold by producers in the United States in 1924, as reported by the Bureau of Mines, Department of Commerce, was 5,439 short tons, valued at $299,277. Of this quantity 730 tons (1,460,897 pounds), valued at $212,035, was sheet mica; the rest was scrap mica.

The production was made by 10 States—North Carolina, New Hampshire, South Dakota, Virginia, New Mexico, Georgia, Colorado, South Carolina, Connecticut, and Alabama, named in order of total quantity sold from greatest to least.

The total quantity of uncut sheet mica sold in 1924 showed a decrease of 29 per cent, and the value a decrease of 32 per cent, as compared with 1923. The figures for the quantity and value of scrap mica sold are not strictly comparable with those of 1923, as the figures for 1924 are exclusive of mica derived from mica schist, while the 1923 statistics include some of this material.

The most notable decreases were shown by North Carolina and New Hampshire, whose sales of uncut sheet mica dropped—in North Carolina 47 per cent in quantity, and 42 per cent in value, and in New Hampshire 11 per cent in quantity and 18 per cent in value.



Top of Riverside Quarry of The Vermont Marble Company. Walls of Concrete and Marble Blocks Have Been Built Around the Opening to Keep Out Flood Waters

Concerning the Hydraulic Elevator

By G. B. Massey

THE August 15th number of Pit and Quarry contained an article describing the sand moving apparatus of the Ward Sand and Gravel Company of Oxford, Michigan. This device consists of introducing pressure water by a nozzle into a pipe in such a direction that it creates a partial vacuum, thus sucking into a branch of the pipe sand and gravel when this branch is placed in contact with sand and gravel. This is the hydraulic elevator in its most simple and inefficient form.

Hydraulic elevators have been used in California for a great many years for elevating by water pressure sand and gravel which has been excavated by the hydraulic gun and is to be raised to a higher elevation to run through the sluice.

The hydraulic elevator has been perfected to such an extent that it is now equipped with a manganese steel throat between the vacuum chamber and the discharge pipe. This greatly increases the efficiency of the apparatus so that the efficiency now stands at about 25 per cent as against 50 per cent for a dredging pump. It is probable that the arrangement without the throat is very much less than 25 per cent efficient.

The U pipe part of the apparatus has nothing to do with the working of it but is simply a convenient method of bringing the pressure pipe to the location of the nozzle.

In 1922 the writer had a problem of moving about 20,000 cubic yards of sand in a pool a distance of about 400 feet. It so happened that no electric power was available, that the work had to be done with great dispatch and the question of cost was, of course, considered. It happened that the work was being done in connection with the improvement of conditions existing about the municipal water works so that pressure water was available 600 feet away at almost any reasonable pressure, and the only cost for supplying the water was the extra fuel and the pipe line to the water's edge. It also happened that there was a substantial timber barge which would not answer for the hull of a hydraulic dredge on account of its size.

It was decided that the best method to use under the circumstances would be a hydraulic elevator, and the builders of these devices were approached, who replied that the hydraulic elevators work with a very shallow depth of water at the suction point and that it was believed that a mixture of air with the water, sand and gravel being elevated was necessary for the proper performance of the mechanism. They also said that these machines were used to elevate material in an almost vertical direction, and it was doubted whether it would be able to carry sand through a horizontal discharge line 400 feet long.

After the matter was considered again very carefully, it was decided to persist in the installation of a hydraulic elevator, and one was purchased together with the necessary pipe. The elevator was mounted on a small scow; pressure water was brought down from the water works and brought aboard the scow by a floating pipe line with a long, flexible rubber hose at the shore end and barge end so as to allow the barge to move around the pond.

The discharge line was led from the discharge orifice of the hydraulic elevator on barrel pontoons, a distance of 400 feet, where the end was lowered so that it discharged under water so that there was no static head. The suction pipe was connected to a suction chamber and was led by means of a flexible rubber suction hose and suction pipe to a point below the water surface where the sand was to be excavated. This suction pipe was raised and lowered by means of a hand winch, and the barge was moved about the pond by hand operated lines.

At first, results were unsatisfactory because it was found that, contrary to expectations, the shell of the elevator was not air tight. This was remedied, and the equipment gave good results from that time on to the completion of the job. It was found that a pressure water was ample, and no improvement was found by increasing the pressure to 80 pounds per square inch. No difficulty at all was experienced in pumping sand at the rate of from 50 to 60 cubic yards per hour through a 12-inch pipe.

The elevator began to pick up material at 25 pounds pressure and senting the facts to the Interstate Commerce Commission. This affords

worked well at 40 pounds, but 70 pounds was the usual pressure used. The work was accomplished at much less than the sum set aside for it, and all the material was salvaged after completion. As stated above, there were several reasons why this arrangement was used, but the same reasons would apply only now and then.

To meet ordinary conditions the centrifugal pump is a much more efficient piece of machinery to use, having twice the efficiency of the hydraulic elevator in its most refined form and probably three times the efficiency of a hydraulic elevator as used at the plant of the Ward Sand and Gravel Company.

Cement Experts Meet

An advisory committee of technical experts on Portland cement consisting of representatives of the United States Bureau of Standards, the Portland Cement Association, and the American Society of Civil Engineers met on September 10th at the Bureau of Standards to review the work recently accomplished in the cooperative research now being undertaken by these groups.

Among the most noteworthy results reported at the conference may be mentioned the exacting experimentation which has led to an acceptance of the findings of the Geophysical Laboratory of Washington on the exact chemical and physical nature of the primary compounds of Portland cement. This view differs in some respects from that held by many European investigators. The American view, in general, holds that Portland cement exists in the $CaO—Al_2O_3—SiO_2$ system in the field $2CaO.SiO_2—3CaO.SiO_2—3CaO.Al_2O_3$, these compounds being the principal constituents of the cement, while some European writers believe that the compound $8CaO.Al_2O_3.2SiO_2$ is the principal hydraulic constituent. Others are convinced that there exists a solid solution of $CaO+2CaO.SiO_2$.

Every effort is being made to concentrate on the fundamental problems of the constitution of Portland cement and the exact influence of each constituent. While studies on hydration and setting are under way, it is held important that these be not investigated exhaustively until reliable principles on constitution have been established. The studies on setting will then be made with the products of rigidly controlled composition. By this means basic laws of composition and behavior in use should be established. For some time the work will be of more interest and use to the producer than to the consumer of cement.

The research staff consists of nine specialists in physical chemistry, petrography and engineering, who have been studying the fundamental problems of Portland cement during the past fifteen months.

Lime Sold In 1924

Sales of lime by manufacturers in the United States in 1924 amounted to 4,072,000 short tons valued at $39,596,423 f. o. b. kilns, according to a compilation of reports of producers made by the Bureau of Mines Department of Commerce. These figures show a reduction in quantity of less than one per cent and in value of about one per cent from the 1923 figures of 4,076,243 tons and $39,993,652. The average value per ton at the kilns in 1924 was $9.72 compared with $9.81 in 1923.

Lime sold for building and construction amounted to 2,169,700 tons valued at $23,011,935, an increase of about 2 per cent in both quantity and value. Lime sold for chemical uses amounted to 1.653,964 tons valued at $14,719,974, a decrease of 3 per cent in quantity and 6 per cent in value. Lime sold for agricultural purposes amounted to 248,336 tons valued at $1,864,514, an increase of 3 per cent in quantity and 2 per cent in value.

The sales of hydrated lime in 1924, included in the above total, were 1,316,664 tons valued at $13,199,846, an increase of 7 per cent in quantity and 8 per cent in value. About 78 per cent of the hydrated lime sold—1,029,384 tons valued at $10,420,151—was for construction work. This was an increase of 12 per cent in quantity over 1923. Hydrated lime for chemical uses (158,870 tons valued at $1,618,873) and for agricultural purposes (128,410 tons valued at $1,160,822) both showed decreased sales as compared with 1923.

The Nazareth Continuous Cement Bag Cleaner

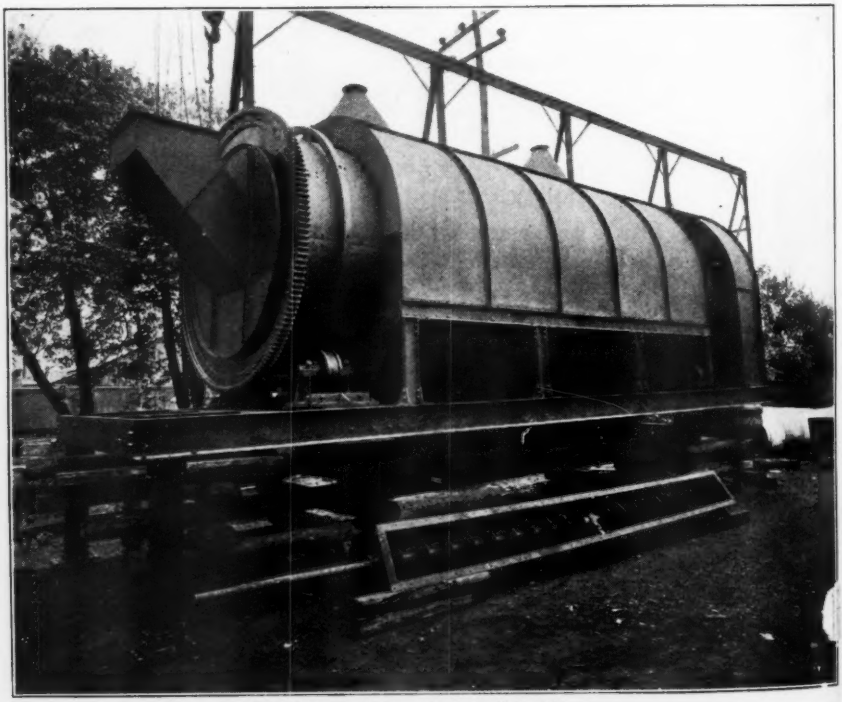
The Nazareth continuous bag cleaner is manufactured by the Nazareth Foundry and Machine Company. The cleaner is a combination of a revolving screen with lifters, within an air tight chamber, connected to a dust collector. The bags to be cleaned are fed into the receiving hopper by means of a belt conveyor. The bags pass through the revolving drum and are discharged through a hopper at the rear of the machine. The reclaimed cement is deposited into a bin running the full length of the screen and is conveyed back into the system.

As it requires seven minutes for the passage of a bag through the machine, split shipments can be separated by allowing a minute or two to elapse when feeding each consignment through the machine.

The machine is in reality a labor saver as it reduces the cost of handling bags. It also reduces the dust nuisance, reclaims material and gives a clean bag. Approximately one pound of cement is saved per bag. The cleaners are built with capacities ranging from 200 to 10,000 bags per hour. The machine can be arranged for gear or chain drive.

Vacuum Recorder Bulletin

Vacuum Recorders are covered in new Bulletin No. 140 issued by Uehling Instrument Co., of Paterson, N. J. These instruments operate on the mercury column principle and employ no moving parts, springs or diaphragms. Permanent accuracy is claimed for this principle, which is clearly illustrated by a sectional diagram. The high degree of legibility of the Uehling Vacuum Recorder is due to the fact that the condenser's working range of vacuum is recorded over nearly the full face of the chart, while the lower degrees of vacuum down to atmospheric pressure, are recorded on a greatly contracted scale. This is clearly illustrated by the sections of typical charts, reproduced full size in the bulletin. One chart makes a record on a scale that is nearly as wide as that of the standard indicating type of gage.



The Nazareth Continuous Bag Cleaner

FOR SALE OR RENT

STEAM SHOVELS—Railroad Type

(Note:—All Railroad Type Steam Shovels can be furnished on full caterpillar mountings if desired.)

1—95-C Bucyrus. Shop No. 1235, 4-yd. or 5-yd. dipper.
1—Model 80 Marion. Shop No. 1312, 4-yd.
1—Model 75 Marion. Shop No. 2112, 2½-yd. or 4-yd. dipper.
3—70-C Bucyrus. Shop Nos. 1197, 1277 and 1582. 2½-yd. dipper.
4—70-ton Bucyrus. Shop Nos. 920, 939, 977 and 1233, 2½-yd. dippers.
5—Model 60 Marion. Shop Nos. 1301, 1995, 1999, 2059 and 2238, 2½-yd. dippers.
2—60-C Bucyrus. Shop Nos. 1286 and 1388, 2½-yd. dippers.
1—45-C Bucyrus. Shop No. 1201, 1¾-yd. dipper.

Steam Shovels—Full-Revolving

1—80-B Bucyrus Stripping Shovel. Shop No. 4002, New 1923, 2½-yd. dipper.
1—50-B Bucyrus. Shop No. 3744. New 1922. 1½-yd. standard dipper or 2-yd. coal loading dipper. Caterpillars
1—Model 36-Marion. Shop No. 4727, 1½-yd. dipper. Caterpillar.
2—Model 31-Marion. Shop Nos. 3341 and 3613, 1-yd. dipper. Traction wheel or railroad truck mounting.
1—18-B Bucyrus. Shop No. 1870, ⅞-yd. dipper. Traction.
1—Model 21 Marion. Shop No. 4294. Steel Caterpillars. ¾-yd.
2—Type "B" Erie. Shop Nos. 206 and 1484. Traction wheel. ¾-yd. dippers.
1—14-B Bucyrus. Traction. Shop No. 1416. ⅝-yd. dipper.

SIDE DUMP CARS

36—16-yd. Western Air Dump Cars.
12—12-yd. Western Air Dump Cars, 19-ft. beds, box girder doors.
4—12-yd. Western Hand Dump Cars, 19-ft. beds, box girder doors.
26—12-yd. Western Air Dump Cars, Truss-rod doors, 26-ft. beds.
2—12-yd. Oliver Hand Dump Cars.
10—6-yd. K. & J. Steel Sills, Truss-rod doors.
5—4-yd. Western Heavy Duty. 36-in. gauge. Steel lined floors.
8—2-yd. Western, 36-in. gauge.
55—1½-yd. Western, 24-in. gauge.

SPREADER CARS

3—Std. gauge Western Spreader Cars.
1—36-in. gauge Oliver Spreader Car.

STEAM SHOVEL PARTS

1—Boom for Marion 60 or 61 Shovel, length 35-ft. 22-ft. dipper arm, 1½-yd. dipper, long jack arms, etc.
1—19-ft. 6-in. boom, 12-ft. sticks and ditcher bucket for Type B Erie Shovel.
1—22-ft. dipper stick for Type B, Erie Shovel.

LOCOMOTIVES—Standard Gauge

1—17x24 Schenectady 6-wheeled Switcher with tender. Shop No. 2956. Weight 44 tons.
1—16x24 Vulcan 4-wheeled Switcher, with tender. Shop No. 1764. Steam pressure 180 lbs. Weight 40 tons.
1—16x24 Davenport 4-wheeled Switcher, with tender. Shop No. 860. Steam pressure, 170 lbs. Weight 38 tons.
1—11x16 Davenport 4-wheeled Saddle Tank Locomotive. Shop No. 1027. Weight, 20 tons. Steam brakes.

LOCOMOTIVES—36-in. Gauge

1—9x14 Vulcan Dinkey. Shop No. 1675. Weight, 14 tons.
2—7x12 Davenport, 4-wheel Saddle Tank. Shop Nos. 1566 and 1567.
1—9-ton Whitcomb Gasoline Locomotive.

LOCOMOTIVES—24-in. Gauge

3—7x12 Davenport Dinkies. Shop Nos. 1202, 1411 and 1524. Weight 9 tons.
1—6x10 Davenport Side Tank Dinkey. Shop No. 1307. Weight, 7 tons.
1—6-ton Whitcomb. Shop No. 1259. Gear drive. Gasoline.

DRAGLINE EXCAVATORS

1—Class 24 Bucyrus. Steam. New in 1919. 115-ft. boom, 3½-yd. Page bucket. Skids and rollers.
2—Class 24 Bucyrus Steam. Shop Nos. 3445 and 3500, skids and rollers, 85-ft. to 100-ft. booms; 3½, 4½ or 5-yd. Page buckets.
1—Class 20 Bucyrus. Shop No. 740. Skids. 85-ft. boom. 2½-yd. bucket.
1—Class 14 Bucyrus. Steam operated. Shop No. 745. Skids, 60-ft. boom, 2-yd. bucket.
1—Monighan No. 2. Shop No. 789. Skids. 60-ft. boom. 2-yd. bucket.
1—Model 210 P. & H. Shop No. 1077. Gasoline. Caterpillars. 42-ft. boom. 1-yd. bucket.
1—30-B Bucyrus. Shop No. 3640. Caterpillars. 40-ft. boom. 1-yd. bucket.

CRANES

1—10-ton Industrial, 4-wheeled. Shop No. 1989, 40-ft. boom, bucket operating.
1—15-ton Ohio. Shop No. 3441. 8-wheeled, M.C.B. trucks. 40-ft. boom, with 10-ft. extension, bucket-operating drums, 1-yd. bucket.
1—20-ton McMyler, 8-wheeled. Shop No. 388, 45-ft. boom, 1¼-yd. O & S clam.
1—Gantry Crane. New in 1919; 40-ft. boom, 15-ton cap., at 18-ft. radius; 7-ft. 10½-in. gauge, 12-ft. wheelbase, self-propelling. Base of boom 17-ft. above track. Bucket-operating drums. Weight, 50 tons.
1—Type J McMyler, 35-ton capacity, with 70-ft. boom. Shop No. BC-2376. Serial No. 3312, 8-wheel MCB trucks, A.S.M.E. boiler.

BUCKETS

1—1½-yd. Class "S" Page Dragline bucket.
1—2½-yd. Class "S" Page Dragline Bucket.
1—3½-yd. Class "C" Page Dragline Bucket.
1—¾-yd. Lakewood Clam Shell.
1—1-yd. Browning Clam Shell. Reeved type.
1—1¼-yd. Williams Hecules Clam Shell.
1—1½-yd. Brown Hoist Clam Shell.
1—1½-yd. Williams Favorite.
3—Mead-Morrison 1½ yd. Clam Shells.
2—1¼-yd. O. & S. Coal Loading Clam Shells.
1—¾-yd. Type "J" Owens.

MISCELLANEOUS

1—8-ft. Austin Giant Road Grader.
1—6x10 D.C., D.D., Lidgerwood Hoist, with 36x 90-in. boiler.
1—6½x10 D.C., D.D. American Hoist, with butt strapped boiler.
1—7x10 D.C., D.D. Lambert Hoist, without boiler.
1—7x10 D.C., D.D. Flory Hoist, without boiler
1—Lambert 8½x10 Double Drum with boiler.
16—No. 8 Milburn Carbide Lights, 8000 Candle Power.
4—No. 12 Milburn Carbide Lights, 12,000 Candle Power.
9—Milburn **Reliance** Carbide Lights, 1,000 Candle Power.
6—Milburn **Builders** Carbide Lights, 500 Candle Power.
1—No. 55 **Buhl** Portable Air Compressor.
13—No. 90 Buhl Portable Air Compressors. New.
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1—No. 10 Byers Semi-Caterpillar Steam Crane, 40-ft. boom, ¾-yd. Blaw-Knox bucket, practically new.

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3—78-C Bucyrus, 1923 model, 30-ft. boom, 19-ft. dipper stick, 3-yd. dipper, two on railroad trucks, one on caterpillar. Shop Nos. 4001, 4124 and 3995.

LOCOMOTIVES

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4—Porter, 36-in. gauge, 18-ton, saddle tank, cylinders 10x16, rebuilt like new. Shop Nos. 4619, 4667, 6748 and 6804.

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18—Ingersoll-Rand D.C.R. 430 Jackhammers.
2—Hardsocg No. 60 Jackhammers.

CRANES

1—Link Belt, 22-ton, locomotive crane, 50-ft. boom.

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8—Model 31, Waugh "Denver" column drills.
1—D.W. 64, Sullivan column drill.
1—Sullivan tripod drill.
2—Ingersoll-Rand tripod drills.
3—Ingersoll-Rand, Class G. 31, Calyx drills.
2—Ingersoll-Rand, Class G.O. 2843 and 2844, Calyx drills with pumps.

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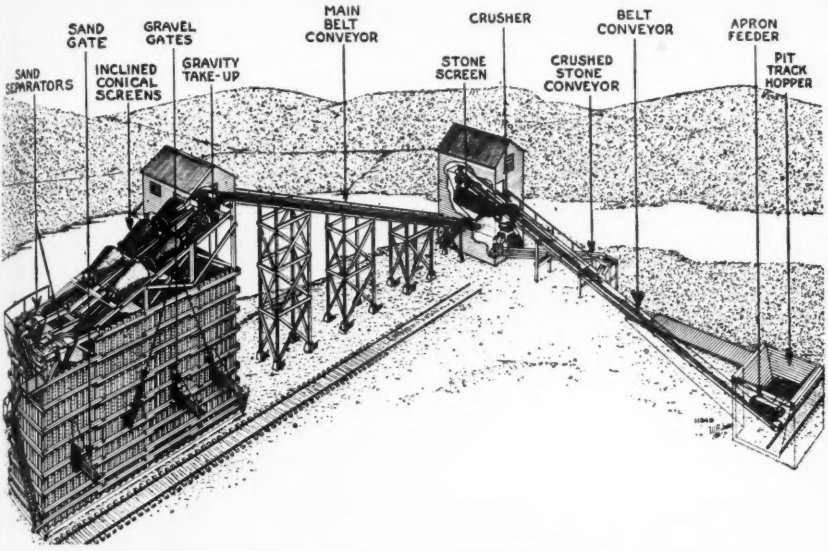

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